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Agriculture.

RUST IN WHEAT.

Is rust destructive of wheat? It does not follow that, because wheat is attacked by rust, the grain is therefore necessarily destroyed. It all depends on what kind of rust appears and what part of the plant is attacked.

In a paper read by Mr. W. Deacon, of Allora, at the Mackay Agricultural Conference, in June, 1899, he said that "Professor Eriksson resolves rust into five main divisions, and these again into ten subdivisions. Of the latter, summer rust is responsible for three, one of which attacks barley and rye, another wheat, and the third oats. He (Mr. Deacon) had never seen rust in barley and rye in the colony. The rusts he was concerned with were the spring or spot rust and the summer or streaky rusts that affect wheat. His experience was that streaky rust was preceded by spot rust. Mr. Farrer says that experience and observation have led him to the conclusion that spot rust in this country does no material harm. The spot or yellow rust, or orange rust, as it is called, is seen on the leaves, and sometimes on the leaf sheaths, but not on the stalk. It may appear at any time, even on wheat four or five weeks old, before the severity of winter; but it generally sets in when the wheat is more advanced, well in the shot blade and earing. It is well to know that it is generally harmless, for many farmers have cut down their wheat on the appearance of this rust, thinking that it would eventually destroy their crop and make it even worthless for hay, and have thereby lost a good yield of wheat."

Now, what follows fully bears out Mr. Deacon's statement. If the flag only is attacked, then the rust is actually beneficial to the grain, because, the flag being destroyed, the whole strength of the plant is directed to the formation of the grain. And there is another great advantage arising from this loss of flag, in that the cost of binder twine is considerably reduced. A heavy crop of clean wheat in a season when rust is absent will carry a very large amount of flag, and as a consequence a sheaf will be about twice as large as if the flag were absent. This means that, instead of 3 lb. of twine, as much as 5 lb. has to be used, and this is a big item in a farmer's expenses. Another thing worthy of note in wheat-growing is that very often the ear as it grows is caught in the sheath, and as the plant continues to grow the ear is bent round because it has not the strength necessary to free itself. When this occurs, it will be found that one-half of the ear contains no grain.

Farmers should carefully note the time when the spot rust appears, and watch its action on the plant. If it does not develop into streaky rust, there will be no cause for alarm or for hastily cutting down what would otherwise in all probability have turned out an excellent crop.

We once saw a farmer starting to cut down a large field of barley because it was attacked by caterpillars. An examination of the crop, however, showed that in no instance had the caterpillars touched anything but the flag. He, therefore, abandoned the idea of destroying it, and as a result had a very good yield of grain.

WHY DO MEN BECOME FARMERS?

A man can no more help becoming a farmer or a gardener than another can help becoming a painter, musician, engineer, soldier, or sailor. All choice of a profession is the result of an inborn, inherited instinct. As it is said of a poet, "*Nascitur non fit*," so it may with equal truth be said that the farmer is born a farmer; he is not magically turned into one. No man can be a successful tiller of the soil unless he has an inborn, ineradicable love for the business.

Is a love for flowers, for instance, an acquired taste, or is it an inherent instinct? We can but believe that the love for flowers, the love of the land, of agriculture, and of rural life generally, are tastes implanted in our souls at birth or which have been inherited by us from our ancestors. All children love flowers; even before a child can speak sufficiently to express its thoughts in intelligible language, as soon as it begins to "take notice," it will instinctively smile and hold out its little hand at the sight of a flower. That this unconscious action is the consequence of inborn instinct is clearly shown by the fact that it will take little or no notice of other animate or inanimate objects, which yet, as it grows older, it loves to possess and to treasure; such, for instance, as cats, puppies, birds, lambs, the glitter and ticking of a watch, the rattle of little bells on some toy—these will attract a very young child's notice; but by and by it will tire of these things, whilst it never loses its love for flowers. This predilection becomes intensified as the child grows older, until the inherent instinct develops itself in a desire to produce these lovely works of Nature itself.

This process of development in most young people becomes daily stronger, even in city-bred children; indeed, it is even more strongly shown in those whose lot is cast in cities, where they toil day after day in factories and workshops amongst the most sordid and uninviting surroundings. Country-bred children, on the other hand, whilst in childhood delight in wandering about the fields and woods gathering wild flowers and fruits, chasing butterflies, hunting for birds' nests, and in many other childish pursuits which are mostly denied to city children, begin to lose their love for the quiet country life as soon as they are old enough to be set to work on the farm. Now it is that their young love for the country should be strengthened in them by judicious treatment, instead of being crushed by monotonous toil varied only by meals and bed.

HOW TO KEEP THE BOYS ON THE FARM

need not be the serious question it now is if parents would but put on their considering cap and try to find out why their boys and girls want to leave their country home for the factory, the office, and, most hopeless life of all for a country-bred lad—the civil service. How are the majority of boys and girls on the farm treated as soon as they have arrived at an age when they are able to make themselves useful? On a dairy farm the cows must be brought in at daylight. This means that the boys are roused out of bed, winter and summer, rain or fine, even before daylight, to first catch and saddle a horse and go after the cows. Then fodder must be brought in and placed before the animals in the bails and in the yard. Then when the men and boys, and often the girls, have finished milking, the shed must be cleaned up and thoroughly washed down, and the milk buckets properly washed out. The cows also have to be taken back to the paddocks.

Now begins the work of separating the cream. After all is done, and the cream is in the cans ready to be sent off, the calves and pigs must be fed, and only after all this do the lads get their breakfast, having by this time been four or five hours at constant work. After breakfast, the cream cans have to be loaded up and sent to the factory or to the railway station. Then begins the daily farm work of mowing lucerne, chaffing maize for the silo, ploughing, harrowing, sowing, potato-planting, in all which operations the boys take their share. At noon comes dinner, with an hour's spell from labour, when another start is made, and soon the usual preparations for the afternoon's milking are in full swing. Fodder is prepared, ensilage got out for the cows, which are again brought in to be fed and milked and turned out again. Separating and cleaning up bring the day's work to an end, with the exception of feeding the horses and other stock. This means working up to 6 or even 7 p.m. In all these labours the boys on many farms have to take their full share. Of course, there are exceptions to this continuous boy work; but when farm wages are high, prices low, and there are two or three good boys in the family, they are

compelled by force of circumstances to work from daylight to dark. And what reward do they get for these arduous services? In many cases, none beyond food and clothes and possibly a shilling or two on a rare holiday. There are cases in which three or four farmers' sons have worked for years on their fathers' land up to the age of eighteen to twenty-one years without their receiving a shilling of wages. How can young men be expected to stay on the land under such conditions? They see other lads who have left home and gone into the city working for eight hours daily, beginning at 8 or 9 in the morning and leaving the office or workshop at 5 or 6 p.m., for a wage which they themselves can never hope to attain to on the farm. They see these town lads well clothed, well fed, well housed, under no obligation to work out in the wet and mud, and naturally they long to go and do likewise. But, unfortunately, they only see one side of the picture, whilst the future is far too distant for them to consider it. They know nothing of the struggles and shifts of hundreds of people in the towns who wearily tramp about looking for work and find none, who have left comfortable homes in the country in the hope of bettering themselves and of leading an easier life than that of the farmer, and who now envy the lot of those on the land, yet cannot go back to it after a long sojourn in the city has taken away from them all love for the monotonous and somewhat lonely life of the man on the land. And thus, day after day, more and more country lads leave the old home to go and swell the ranks of the unemployed. What is the lot of these sons of well-to-do farmers who have educated their sons and daughters in the hope of their getting a Government billet? If young country lads who have thus been educated would only sit down and think for a moment of the years of drudgery at the desk, the small pay which all has to go for board and lodging and decent dress, not to speak of little luxuries to which they are tempted in the companionship of others situated like or better off than themselves, the slow promotion which often never comes, the constant liability to retrenchment, and the final retirement with perhaps not a penny saved for old age, and would then look round and consider the independent life, hard though it be, of the farmer, they would surely think twice before giving up the substance for the shadow. Is it possible to make farm life sufficiently attractive to induce the young men and women to remain on the farm? We think it is possible. In the first place, every boy and girl should be taught to take an intelligent interest in the farm. This interest, be it observed, being already possessed before it is driven out of them by wearisome, unrequited toil. The surroundings of the home should be made attractive, and the young people encouraged to make them so by teaching them something of gardening, flower and fruit growing, &c. They should have a small bit of garden which they could consider their very own, and to encourage them to work it they should be given seeds and plants, and the father and mother should spare a few moments to help them and teach them how to make their little garden productive and attractive. Whatever produce, in the shape of flowers, vegetables, or fruit which they raised, was sold should be placed to their credit.

Most children are fond of chickens. Then let them help their mother to set a clutch of eggs, to feed the fowls and chickens, and give them to understand that the young chicks will be their own property.

In this simple way the foundation may be laid for a wider interest as time goes on. Before all, no forced labour should be exacted from boys or girls. They should be brought up to understand that all that is done on the land, all that is done for the welfare of the live stock, is so much done for their own welfare, and they should be *encouraged* to help—not *driven* to do so.

Has anyone ever noticed how fond the small child is of "helping daddy" to feed the cows or pigs, or "helping mummy" to feed the fowls, or string the beans, or make the pudding? Well, this desire to help comes from not being driven to help. Once drive a child to work and punish it for not working, and all the desire to help is killed.

AGRICULTURE THE TRUE SOURCE OF WEALTH.

The economic question of the future will be to provide the food supply of the ever-increasing population of the world in the next century. It will come as a surprise to most people that Mr. James J. Hill, whose life work of developing the unoccupied lands of the United States of America has peculiarly fitted him to speak on the subject, considers that agriculture, in the most intelligent and comprehensive meaning of the term, is something almost unknown except in the United States. The value of all farm products last year was 6,415,000,000 dollars (£1,283,000,000), which, after it had been discounted for high prices and current favourable conditions, would be represented by an average total of 5,000,000,000 dollars (£1,000,000,000). Of the lands taken up in the United States, little less than one-half is under cultivation. Were the other half utilised, the output of the soil would be doubled. The methods by which the yield could be increased are three: First, the rotation of crops, which is so little followed that the farmers have been raising year after year the same crops on the same land until the soil has become all but exhausted. The second method of increasing the yield is the liberal use of fertilising material, and the third and most interesting of all is better tillage.

As showing what intense cultivation will do, Japan is quoted as supporting 45,000,000 of people on 10,000 cultivated square miles, aided by the food products brought in over sea; while the market gardener in Paris is quoted as declaring that all the food, animal and vegetable, required for 3,500,000 people can be grown by methods already in general use on the 3,250 square miles of gardens surrounding the city.

THE ABC OF MANURING.

EVERY FARMER HIS OWN EXPERIMENTER.

A series of most interesting articles on profitable manuring have for some time appeared in the "Mark Lane Express." Of course much of them is applicable more to British farming than to farming in this country; still there is a great deal to be learned from them, and we only regret that our limited space prevents us from quoting largely from these articles. The following extracts, however, apply to farming and manuring in all countries. The authors, Messrs. H. B. M. Buchanan, B.A., and J. J. Willis, superintendent of the Rothampton Field Experiments, say:—

Even if we think we know our subject sufficiently, it is advisable, in order to strengthen our grip of it, that we should from time to time again more fully study its alphabet, to yet once again take up and read through the elementary primer, the simple text-book. The subject will by this means become more real and self-evident to us, more a part of our everyday working life; and, if the beginnings of our subject be simple and connected in our minds, we can acquire all further knowledge concerning it much more easily and with a much clearer insight.

There are really only very few principles in connection with practical manuring that the farmer need concern himself about. If his farming is to pay, he has to see to it that his land contains a certain amount of humus, a sufficiency of phosphate, nitrate, potash, and lime; that the particles of the soil are surrounded with a plentiful supply of warm, pure air; that the soil holds a sufficient but not an excessive amount of moisture; and lastly, but not least, that the soil is stored with healthy, vigorous germs of life called "bacteria."

If any one of these important principles is absent from the soil or not present in sufficient quantities, the crops will suffer and starve. The soil may be rich in phosphates, and yet if the nitrates are absent, or not present in sufficient quantities, the crops will show a small, and therefore an unprofitable, yield. The same will hold true if the nitrates are present and the phosphates absent, or if both phosphates and nitrates be present in sufficient quantities

and potash be absent, or if potash be present and phosphates or nitrates absent. Or the soil may be rich in phosphoric acid and nitric acid, and yet if there be not present in the soil a sufficiency of lime to enable the phosphoric acid to combine with it easily to form phosphates, or to allow nitric acid to combine with it to form nitrates, the crops will suffer.

Bacterial germs and a circulation of warm, pure air and moisture must also be present in rightful and healthful quantities if the important work of the preparation of plant food in the soil is to be carried on abundantly and readily. To increase the store of plant food in naturally poor soils, and at the same time to compel the soil to yield profitable crops, is the problem set before every practical farmer.

HOW PHOSPHATES ARE FORMED.

Phosphates are formed by the chemical union of the element phosphorus with the gas oxygen, which union the chemist terms an oxide, and this oxide combines with moisture to form phosphoric acid, and phosphoric acid lastly combines with the lime of the soil to form phosphates, and phosphates, when in a soluble condition, can be taken in by the roots of plants, and is one of the perfected foods that all our crops require.

HOW NITRATES ARE FORMED.

There are two ways by which nitrates are formed—

1. Nitrogen gas combines with oxygen gas and forms an oxide, and the oxide combining with moisture forms nitric acid, and nitric acid combining with the lime of the soil forms nitrates, and nitrates, when in a soluble condition, can be taken in by the roots of the plants, and is another of the perfected foods that all our crops require.

2. When organic matters, such as animal and vegetable remains, roots of plants, stubble, and farmyard manure, begin to decompose, the nitrogen combines with oxygen and forms ammonia gas; this ammonia gas combining with moisture through the agency of soil germs forms nitric acid, and nitric acid combining with the lime of the soil forms nitrate of lime or nitrates, which is one of the most soluble of plant foods.

POTASH.

Potassium, like phosphorus, is never found in a free state in Nature. It is a constituent of many minerals. When united with oxygen in the proportion of 2 of potassium to 1 of oxygen, there is formed the potash of commerce.

LIME IS NECESSARY.

From the foregoing outline it can be seen that, if phosphates and nitrates are to be formed in the soil, there must be present a sufficiency of lime to enable phosphoric acid and nitric acid to form phosphates and nitrates respectively. Lime is a necessary ingredient of every agricultural soil; without it plants cannot grow. Lime is not, however, usually considered a plant food in itself, yet it is a most important element of plant food, because it converts the insoluble and unusable plant food in the soil into a soluble and usable plant food. By its mechanical action lime corrects the damp and acid conditions so common to our clayey and marshy soils. It lightens and drains the heavier soils, and so allows a free access of warm air to circulate amidst the soil particles. Lime also enables the plough and cultivator to pulverise or break up the soil into a greater number of soil particles; in other words, it helps the mechanical implements to prepare a good seed bed or tilth, and a good tilth is of the utmost importance if profitable crops are to be grown.

Lime also consolidates the lighter and more sandy soils, so that they are the better able to retain moisture and warmth. Lime further helps the crops to ripen earlier, and, above all, on our heavier soils it strengthens the straw of

the cereal crops, so that they can develop a heavier yield of grain. By strengthening the straw, the crops are better able to stand up against heavy storms of wind and rain, which otherwise would considerably "lodge" the crops and interfere with the satisfactory ripening, and add to the expenses of harvesting.

The miller maintains that lime in the soil helps the wheat plant to develop a harder berry—a berry richer in that variety of gluten which is so essential, from a baker's point of view, to ensure a good-looking, well-risen, digestible, and strengthening loaf of bread.

GINSENG.

Mr. F. Jones, Commissioner of Trade in China, has furnished the following information concerning ginseng to the Under Secretary for Agriculture and Stock, Brisbane:—

American ginseng in China is handled entirely by Chinese firms; hence it is rather difficult for the producer to establish direct connections. All business is conducted through the middleman, who appropriates a large share of the profits. Another difficulty is the Chinese method of grading the roots. Ginseng, that is shipped from America as first quality, on arrival, may vary through several grades, according to the standard set by the middleman, who sorts, ties, and prepares it for the market. Large roots, running ten pieces to the catty (one and one-third pounds) and of firm consistency, are considered the best, and bring 40 to 45 dollars Mexican, equal to 20 to 22·30 dollars gold (or from £4 to £4 9s. 7d.), per catty. Other qualities, running more pieces to the catty, bring varying prices, down to 25 dollars Mexican, equal to 12·50 dollars gold (£2 10s. 5d.) per catty.

As to why cultivated ginseng is considered of poorer quality than the wild, the Chinese make no distinction as regards this point, but, in the grading, the cultivated product seems to fall lower in the scale on account of it being less firm in consistency than the wild. A spongy root is practically worthless. If the ginseng is not well packed and absorbs moisture in transit, it also lowers the grade materially. On account of these difficulties to be overcome, it would seem advisable to endeavour to find a Chinaman buyer in Brisbane for some portion of the first crop now being cultivated at our State farms, and I would handle the remainder. A good test of values could thus be obtained. There is always a good local market for American ginseng in Shanghai and Hongkong.

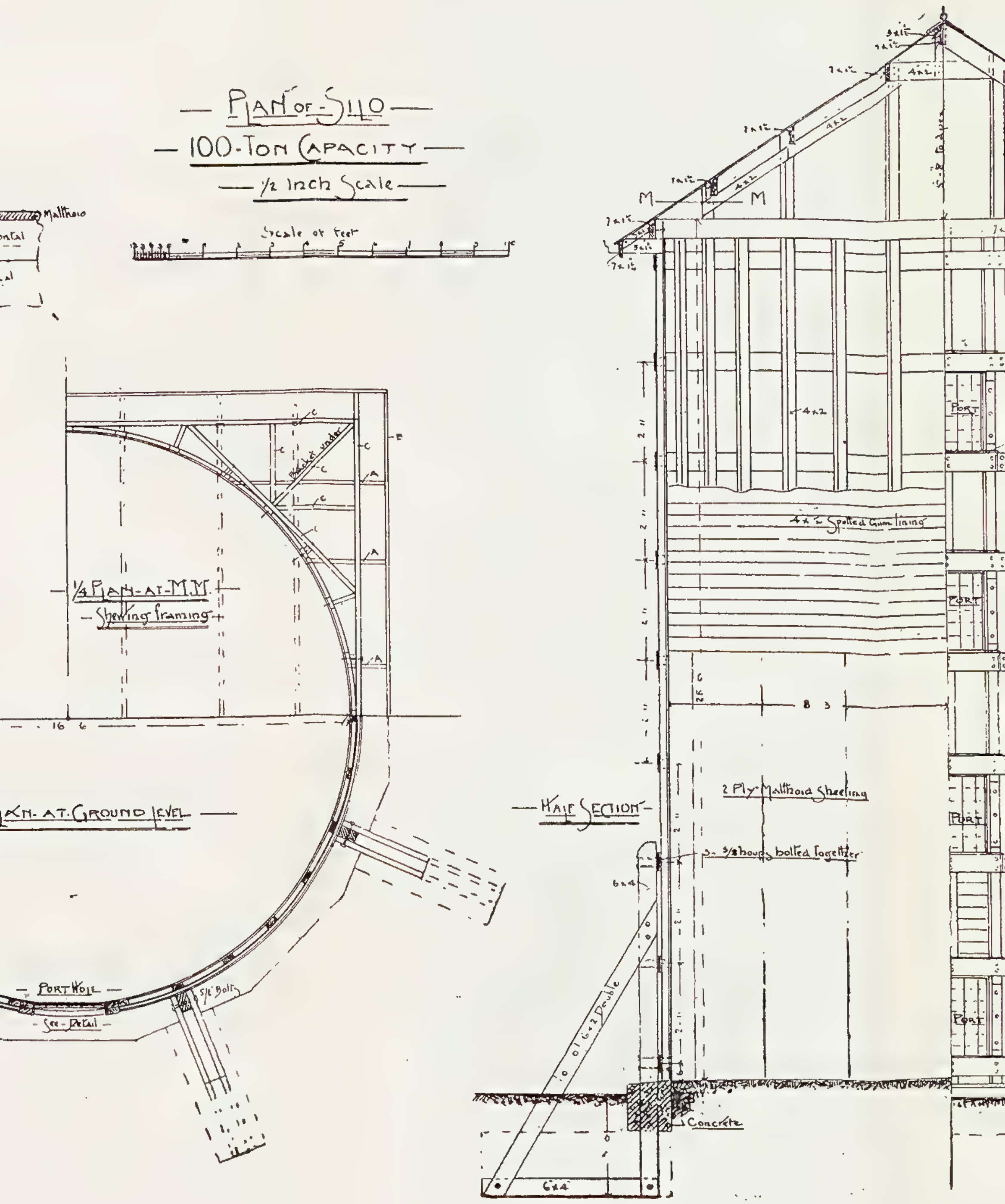
SPECIFICATION OF LABOUR AND MATERIAL REQUIRED IN THE ERECTION OF A SILO OF 100 TONS CAPACITY FOR THE DEPARTMENT OF AGRICULTURE AND STOCK, BRISBANE.

The whole of the work is to be performed in strict accordance with the plan and this specification, with new materials the best of their respective kinds, free from flaws and defects of every description.

The inner diameter of the silo is 16 feet 6 inches, and the height from floor to top-plate 25 feet.

Excavate for the concrete foundation as shown to a depth of 1 foot 6 inches by 1 foot 4 inches in width on an average; inside to be circular, outside polygonal; use the excavated earth to raise the floor about 3 inches above ordinary ground level, and well ram same so as to thoroughly consolidate it.

Excavate for the foundation blocks, 8 in number, to the depth of 3 feet and to the length and width shown, and remove any surplus earth.


Plan of Silo
100-Ton Capacity
½ Inch Scale
Scale of Feet
Malthoid
1/4 Plan at M.M.
Shewing framing
Bracket under
Plan at Ground Level
Port Hole
See Detail
5/8" Bolts
Half Section
4 × 2
4 × ½ Spotted Gum lining
2 Ply Malthoid Sheeting
8 3
3-5/8 hoops bolted together
6 × 4
6 × 2 Double
Concrete
Port
M
M

Concrete to be composed of 1 cask or 3 bags of Portland cement to 31 feet cube of clean river gravel, free from impurities of every description, and containing a fair proportion of clean coarse sand; if gravel is not easily obtained, 20 cube feet of metal, broken to 1½-inch gauge, and 11 feet of clean coarse sand should be used, mixed well together twice in a dry state and twice wet, then wheeled into position and thoroughly well rammed until the water appears on the surface.

The concrete for foundation blocks should be 2 feet in depth by 1 foot 6 inches in width, and should be thoroughly well rammed round posts.

Foundation posts to be 6 inches by 4 inches ironbark, 3 feet in the ground and 7 feet 6 inches above, tenoned into 6-inch by 4-inch sill-piece, and strutted with two 6-inch by 2-inch struts, checked ½-inch into post and sill, blocked with a 3-inch piece, and well bolted together with ½-inch bolts. Care should be taken to fix these perfectly upright and in true position, or much trouble will be experienced as the work proceeds, the inner face of these posts should be 8 feet 7⅜ inches from the centre pin.

Before fixing, the whole of the posts, sills, and struts should be twice tarred with hot coal tar, boiled with pitch and resin in the proportions of 1 gallon of tar to 1 lb. of pitch and ½-lb. of resin.

The hoops to be of 6-inch by ⅝-inch spotted gum, carefully bent round the circle, and bolted to posts and studs with two ⅜-inch bolts in each, with fishplates to cover all joints on the outside.

The three bottom hoops to which the foundation posts are bolted should be built up with three 6-inch by ⅝-inch spotted gum; the first hoop should be carefully curved to the true circle by means of a trammel, and nailed to the foundation posts; the second hoop should then be fixed and nailed to the first, care being taken to break the joints; the third should then follow, nailed in the same manner, the joints corresponding to the first; a 4-inch by 2-inch ironbark stud should then be set up opposite each post, and the whole firmly bolted together with ½-inch bolts, with heads flush on the inside of the stud; care should be taken to keep the studs perfectly plumb and true; the whole of the 4-inch by 2-inch studs should then be set up true to position and bolted to the hoops.

Each rib of the bottom hoop and the bottom of all studs up to the top of the hoop should be well tarred as before described before bolting up.

The 6-inch by ⅝-inch spotted gum for hoops should be of such a length as to require not more than three fishplates in its circumference.

Studs, where shown, to be sufficiently high to carry roof purlines.

Roof timbers to be 7-inch by 1½-inch pine for purlines, ridge, and top-plate, and for framing at angles, as shown at plan M.M. Eaves and gable fascias to be 7 inches by 1¼ inches; straining posts and struts in roof to be 4 inches by 2 inehes, as required.

Fascia bearers at eaves to be 5 inches by 1½ inches, stiffened with 3-inch by 1-inch, checked into top-plate and well nailed.

Each angle to be bracketed out with a 4-inch by 2-inch hardwood bracket, as shown.

Ports should have 4-inch by 1-inch stops, carefully fitted and bevelled to suit, so as to make them as tight as possible. The framing for same should be of 4-inch by 2-inch hardwood, bolted together or strongly nailed, flush on the inside, with 5-inch by 1½-inch sill-piece let in to receive stops and sill-framing; the top of ports on the outside should have a 4-inch by ½-inch piece cut in between studs or top of hoop, and slightly tilted to throw off the water.

Doors for ports should be of 4-inch by ½-inch double, vertical, and horizontal, well nailed together from the outside, and clinched on the inside, and covered with malthoid on the inside, as presently described.

The whole of the inside should be lined with 4-inch by ½-inch spotted gum, with shot edges, well nailed with two nails to each stud, and got up as tightly as possible, all joints to butt closely on studs.

All hoops, studs, and lining boards where exposed, including joints of the latter, to have one coat of paint before fixing.

Line the whole of the inside with 2-ply malthoid, the sheets to be placed vertically. Give a 2-inch lap to each seam, and spread the cement paint which is supplied with the material between the overlapping edges with a brush, cold; nail the seams, 2 inches apart, or, if large-headed nails are supplied, nail 1½ inches apart; well cover the heads of all nails with the cement paint supplied for the purpose.

In fixing, the inner surface of the roll should be the exposed face. Finish neatly round port holes, well nail and cement same so as to prevent it breaking away.

When complete, paint (three coats) the whole of the external woodwork with best oil paint (including priming coat) of approved colour.

Fix 4-inch by 3-inch galvanised-iron eaves gutter on brackets, and 3-inch downpipe to convey the water from same.

Cover the roof with 24-gauge galvanised iron, 6-feet sheets, well nailed with lead-headed nails, and 16-inch galvanised ridge-capping.

QUANTITIES OF MATERIALS REQUIRED IN THE ERECTION OF A SILO OF 100 TONS CAPACITY; INSIDE DIAMETER, 16 FEET 6 INCHES; HEIGHT, 25 FEET.

6 yards cube concrete in foundations and round foundation blocks, containing the following:—

5 yards cube 1½-inch gauge metal;
3 yards coarse sand;
6 casks approved Portland cement.

	6″ x 4′	ironbark	foundation posts, 8/10½, 8/5.
	6″ x 3′	,,	blocking for struts, 1/8.
	6″ x 2′	,,	struts for same, 16/10.
	4″ x 2′	,,	studs, 4/30, 4/26, 22/25, 1/16, 4/5, 4/28.
	4″ x 1′	,,	stops for ports, 4/10.
	5″ x 1½′	,,	sills for ports, 1/12.
	6″ x ⅝′	spotted gum	for hoops, 45/18.
	6″ x ⅝′	,,	fishplates, 27/4.
	4″ x ½′	,,	lining for inside with shot edges, 1,450 feet super. face measurement.
	7″ x 1½′	pine	roof purlines, 9/19, 2/17, 4/7, 4/9.
	7″ x 1¼′	,,	fascias, 2/19, 4/12.
	5″ x 1½′	,,	4/10.
	4″ x 2′	,,	4/10.
	3″ x 1′	,,	6/10.
	3″ x 1½′	,,	4/19.
48	11″ x ½′		bolts, nuts, and washers for foundation blocks, cup-headed.
40	8″ x ½′		bolts, nuts.
8	5″ x ½′		,, ,,
12	5″ x ½′		,, for roofs.
6	4″ x ½′		,,
16	8″ x ½′		,,
54	5″ x ⅜′		bolts for lining and hoops, &c.
126	4½″ x ⅜′		,, ,,
54	4″ x ⅜′		,, ,,
300	3″ x ⅜′		,, ,,

7 rolls 2-ply malthoid roofing.
40 6-ft. sheets 24-gauge galvanised iron.
4 lengths 16″ ridge capping.
7 ,, 4 x 3 eaves spouting.

8 lengths 3" down piping, with beads and clips.
14 lb. lead-headed nails.
14 lb. 1" medium wire nails.
7 lb. 1½" light ,,
7 lb. 2 x 9 ,,
7 lb. 3 x 9 ,,
1 drum of coal tar.
1 tar brush, 4 lb. pitch, 2 lb. resin.
56 lb. white lead.
3 lb. red lead.
2 gallons raw oil.
2 gallons boiled oil.
7 lb. putty.
½-gallon turps.
½-lb. driers.
4 lb. dry umber, 1 6-oz. brush, 1 sash tool.

SHEEP IN DRY DISTRICTS.

The chairman of the Rhine Villa Branch of the South Australian Bureau of Agriculture, at a meeting of members on 29th March last, opened a discussion on keeping sheep in dry districts. He thought that every farmer should keep a few sheep, as they gave a good return for the outlay, besides which they kept the land clean and provided meat for the household. He considered the best class of sheep for this district was the Shropshire-Merino cross, as they thrived better than the pure merino during a dry season. He had seen this demonstrated amongst mixed flocks. The hon. secretary brought forward the question as to whether it was more profitable to keep breeding ewes (six-toothed) or weaners. It was agreed that 150 weaners could be kept on the same land as 100 breeding ewes, and on this basis the following figures were agreed upon by members as a fair statement of the probable cost and returns for the first year from the two classes of sheep:—Cost of 100 ewes, at 12s. 6d. each, £62 10s.; returns—80 lambs, at 7s. 6d., £30; 100 fleeces (9 lb. each), at 8d., £30; 20 fat ewes, at 15s., £15; 80 full-mouthed ewes, at 10s., £40. Total returns, £115. Cost of 150 weaners, at 7s. 6d., £56 5s.; returns—150 fleeces (8 lb. each), at 8d., £40; 150 mixed two-toothed, at 9s. 6d., £71 5s. Total returns, £111 5s. The difference in these returns was small, but on the second year's operations the results would be considerably in favour of the young sheep.

STABLE MANURE.

SHOULD IT BE USED FRESH OR WELL-ROTTED?

When manure is heated and becomes well rotted before it is applied to the soil, the elements of plant food are in a more immediately available form, and can be made use of more readily by the growing crop. A certain amount of decomposition must take place before the elements in the manure are in a form that they can be made use of by the plants. The process of decomposition goes on much more rapidly, if the manure is piled, than if taken to the field green, consequently if a readily available manure is required it might be better to allow it to rot before applying. This practice is followed with advantage on truck or garden farms, where a quick-acting manure is required, and can be applied each year; but for general farm conditions we would not recommend it. When manure is allowed to accumulate and heat, there is a very heavy loss of nitrogen, the most valuable fertilising element. If exposed to rain, serious loss results from leaching; and through the escape of ammonia in the air, and the loss of nitrates in drainage water, one-half or more of the original fertilising

value of the manure is sometimes lost. If it is desired to store manure, the best way is to keep it under a shed where it will be sheltered from rain, and where it will be well tramped by stock.

By this means leaching will be prevented and the heating process retarded as much as possible, but still the loss will be considerable. If, on the other hand, the manure is taken to the field green and spread over the land, the process of decomposition is arrested, and any leaching that may take place will merely carry the fertilising elements into the soil where they are wanted. While manure applied in this way is not so readily available, its influence extends over a much longer period, and this in general farm practice is an important consideration.

One argument that is often advanced in favour of well-rotted manure is that the heat generated in fermentation will destroy any weed seeds that may be present. It is true that some of the weaker weed seeds may succumb during the process of fermentation in the manure; but it has not been shown that any very large proportion of weed seeds is destroyed in this way.

For sandy or gravelly soils, well-rotted manure is usually to be preferred, as the application of coarse green manure is likely to leave the soil too loose and open, and therefore too subject to drought.—"New Zealand Farmers' Weekly."

HOW TO ENRICH A POOR FARM.

If a poor farm is taken in hand by an energetic man who is up to date in his knowledge and practice, it can generally be transformed in a few years into a satisfactory property. The growth of a good green crop by the help of liberal dressings of phosphatic fertilisers is the first step, and afterwards the ploughing under of the green stuff. When the soil is provided with the humus and nitrogen of the green crop, it will begin to improve, and soon pass from the condition of an invalid into a farm of robust condition.

GROWING TUBERS FROM POTATO STALKS.

A Wellington resident assures the "Advocate" that he is this year growing tubers from potato stalks. For several seasons past he claims to have experimented successfully. He cuts about 6 inches from the stem of a growing potato, splits the stem about an inch at the end, and inserts it in the ground. As many as seven good-sized tubers have, he says, been known to have grown at the end of the stalk.

THE MANURING OF POTATOES.

In the course of a pamphlet issued by the Board of Agriculture based upon results of experiments run by Professor Seton, of the Yorkshire College of Agriculture, the following remarks having reference to manuring the crop are quoted:—

DUNG SUPPLEMENTED WITH ARTIFICIALS.

The most common system of manuring potatoes is to apply a moderate dressing of dung—say, about 10 tons per acre—and supplementing with artificials. In the use of the latter along with dung caution is necessary; it is believed that artificials are frequently applied in excess of the requirements of the crop, and that, in consequence, smaller profits are obtained than when more economical methods are followed.

When crops of from 9 to 10 tons per acre can be grown solely by the aid of moderate dressings of dung, there is a risk that any increase in yield obtained by the additional use of artificials may be produced at too great a cost.

The following mixture of artificials per acre may be recommended as a safe and reliable one under most circumstances, and no farmer should use artificials in greater quantity along with 10 tons of dung until he has thoroughly satisfied himeslf by experiment that it can be done with profit:—1 cwt. sulphate of ammonia, 2 cwt. superphosphate, 1 cwt. sulphate of potash.

THE EFFECT OF ARTIFICIALS WHEN NO DUNG IS APPLIED.

Although dung is generally regarded as essential in the manuring of potatoes, very good and highly profitable crops can be grown without it.

The following mixture of artificials per acre may generally be depended upon to produce as big a crop of potatoes as 10 tons of dung:—2 cwt. sulphate of ammonia, 4 cwt. superphosphate, 2 cwt. sulphate of potash.

Dung, when readily obtainable, will doubtless prove more economical than the above mixture of artificials, but there are times—*e.g.*, after "seeds"—when such a mixture alone will give quite as profitable returns as 10 tons of dung.

LARGE OR SMALL SEED POTATOES.

Mr. John H. Fairhurst, in a letter to the "Dannevirke Advocate," supplies the following particulars of careful experiments made to ascertain which paid best when planting potatoes, to use small or large seed. Three rows of equal length and equal number of sets were planted with Northern Star potatoes as follows:—No. 1: 38 sets weighing 3 lb., which produced 54 lb. of potatoes. Row No. 2: 38 sets weighing 4 lb., produced 64 lb. of potatoes. Row No. 3: Weighing 7 lb., which produced 92 lb. of potatoes. Assuming that the seed cost 1d. per lb., and the produce sold at 1d., we find row No. 1 returned 4s. 3d.; row No. 2, 5s.; and row No. 3, 7s. 1d.—clearly a great gain in favour of the larger sets. All were planted on the same day, in equal ground, and all had the same amount of cultivation.

SOIL NITRIFICATION.

According to an article in the "Chemical Trade Journal," the reason of the failure of the proposal to inoculate the soil with the nitrifying bacteria of the nodules of leguminous plants has been investigated, and it has been found that the seeds in germinating give off substances that are deleterious to the organisms. The inoculation of the plants should, therefore, not take place until after the seeds have swollen up and are commencing to grow. As, however, this is not practicable, it was necessary to find a substance that would counteract the injurious effect of the germinating seeds, and a very effective material was found in milk, especially when it contained some peptone or grape sugar. According to later researches, humus substances may be substituted for the milk with even more favourable results. Two points that should be kept in mind in applying nitragin are, that the bacteria do not become active in extracting nitrogen from the air, so long as combined nitrogen is available in the soil, and that there must be a sufficient supply of mineral food.

FLAX AND LINSEED.

During a visit to Melbourne at the time of the A.N.A. Exhibition we had the pleasure of an interesting conversation with Mr. J. Robilliard, Director of the Technical Museum of the Department of Agriculture, Victoria. Mr. Robilliard is a great advocate for the extension of the flax-growing industry, which comes under his jurisdiction. He said that the Department advises the farmer that their object should be to grow for both seed and fibre, and it is pointed out that if they do this they will be able to get about double returns

from their land. "A good flax crop," says Mr. Robilliard, "will produce 9 cwt. or 10 cwt. of seed per acre, the value being £15 per ton, and 5 cwt. or 6 cwt. of fibre, worth from £40 to £45 per ton, and it is claimed that even though the cost of labour is considerable the net returns are excellent." An additional impetus is expected to be given to the flax industry at an early date by the introduction from America of a plant that will make it possible to convert the stems into fibre suitable for rough cordage and binder twine without putting it through the process of retting. By this means a double benefit is expected to accrue to the farmer, for not only will an increased demand for flax spring into existence, but it will be possible to manufacture binder twine locally at a very much lower cost than that at which it can be produced at present.

From all we could learn on the subject, it would appear that considerable attention is being paid to the production of flax and linseed in Victoria.

PASPALUM FOR SEED.

On this question a New Zealand farmer writes:—I have been a grower of this grass for seed for about ten years, and I find the best method is to cut the seed heads about 18 inches long with a reaping-hook, and place them in small bundles on the grass. Great care should be taken to handle it gently, as the ripe seed easily falls. Each day's cutting is taken at once to the barn, where it is placed in rows crossing each other, so as to allow free ventilation. In three days the bundles are shaken on a sheet or floor, the ripe seed coming out freely, and the unripe seed and husks, which remain on the stalk, are carted away and spread on the paddocks. About 5 per cent. of the seed will germinate, and thus improve the paddocks. The good seed is then placed on sheets, spread out to dry, and sieved, after which it is placed in the seed bins. I have sown the seed in October and November, and cut the ripe seed in the following March and April for first crop, and a month later cut it again, thus showing that it does not take five months for the seed heads to ripen. As to leaving the seed in stooks, that is wrong. In the first place, it is almost impossible to stook paspalum grass. To show how easily the seed falls when ripe, a heavy wind or rain will send a great deal to the ground, which I know from experience, having lost much seed this last season from this cause. Seed grown by men of experience can be brought up to 90 per cent. germinating power. The grass can also be cut with machine for seed. Canvas covers are used along the row of cut grass, which is taken up and shaken on the sheet, and then thrown away for hay. You will in this way get only the very best seed, the unripe going with the hay. The machine will lay the grass down more gently than if cut by hand, and although you will get less seed it will be of the best quality.—"Garden and Field."

ABOUT FENCING.

In all farming districts, whether in scrubs, on forest land, or on plain land devoid of timber, the question of fencing, either for the cultivated land or for the paddocking of stock, has to be considered. Many kinds of fencing have been adopted, log-fencing, snake-fencing, fork-and-sapling, wire (plain and barbed), and two or three-rail split post and rail fence. The three former may be dismissed as being mere makeshifts, adopted either for the purpose of getting heavy timber off the land, or for getting a bit of cultivation land, stockyard, or paddock ready in a hurry. The two latter constitute permanent fencing, and do not suffer so much from bush fires as the former. The landowner who breeds cattle, sheep, and pigs has to adapt his fences to the safe-keeping of his stock. In timbered country he will put up a two-rail fence, the three-rail being no longer in such favour as it was thirty years ago.

THE TWO-RAIL FENCE.

The posts for a good substantial two-rail fence should be 7 feet long by 3 inches in thickness; the rails from 8 to 10 inches in width, the lower rail heavier than the upper. The posts should be about 8 feet apart, which allows for the tenon at each end of the 9-feet rail, and should be sunk 2 feet into the ground. A plain or barbed wire beneath the lower and between the upper and lower rail renders it proof against any kind of stock except pigs. Many farmers place a sapling cap on the top of the posts as a precaution against animals given to jumping. This gives a height above the ground of over 5 feet, which few animals will attempt to jump. The number of posts required per mile at 8 feet—really 9 feet—distances apart is 588, and the number of rails 1,174. At 12 feet apart there will be 440 posts. These numbers must not be taken as fixed, since gullies and other obstructions may necessitate short and long panels.

Where palings are required to keep out wallabies and other marsupials, it is customary to reckon 20 palings to the panel of 8 or 9 feet, but broad palings will generally run to 16 or 17 per panel. Taking the larger number, 11,760 will be required per mile.

WIRE FENCES.

In plain country, where timber is scarce and haulage expensive, the settler must have recourse to wire fences, the wire either barbed or plain. The cost of such a fence depends upon the kind of wire used, the number of wires, the expense of carriage and of labour, and the abundance or scarcity of timber for posts.

The posts for a wire fence should be from 9 to 12 feet apart. In the latter case, one or two droppers should be used to stiffen the fence. The corner posts must be put 2 feet 6 inches or 3 feet in the ground, and well braced on both lines, and to counteract the resultant force of the two strains a brace or strut should be put on the inside of the corner post.

Straining posts are not absolutely necessary, as it is sufficient to brace the post whence the strain is made; in fact, some say that straining posts at intervals on a line of fence are most objectionable.

ALL-BARBED-WIRE FENCES.

Amount of Barbed Wire Required.

The estimated number of pounds of barbed wire required to fence the spaces or distances mentioned with one, two, or three lines of wire, based upon each pound of wire measuring 1 rod ($16\frac{1}{2}$ feet), is as under:—

	1 Line.		2 Lines.		3 Lines.	
1 square acre ...	$50\frac{2}{3}$	lb.	$101\frac{1}{3}$	lb.	152	lb.
1 side of a square acre	$12\frac{2}{3}$	,,	$25\frac{1}{3}$	,,	38	,,
1 square half-acre ...	36	,,	72	,,	108	,,
1 square mile ...	1,280	,,	2,564	,,	3,840	,,
1 side of a square mile	320	,,	640	,,	960	,,
1 rod in length ...	1	,,	2	,,	3	,,
100 rods in length ...	100	,,	200	,,	300	,,
100 feet in length ...	$6\frac{1}{16}$	,,	$12\frac{1}{8}$	,,	$18\frac{3}{16}$	,,

Length and Weight of a Coil of Wire.

Thick-set barb, 3 inches apart, 450 yards; weight, 1 cwt.

Black steel fencing wire, No. 6 gauge, 397 yards; weight, 1 cwt.; 495 lb. per mile.

Black steel fencing wire, No. 8 gauge, 573 yards; weight, 1 cwt.; 344 lb. per mile.

Plain wire, No. 6 gauge, 28½ lb. per 100 yards, and, less or more, 502 lb. per mile.

Plain wire, No. 8 gauge, 19·8 lb. per 100 yards, and, less or more, 348 lb. per mile.

Weight of Wire in Fence, per Mile.

	2 Wires.			3 Wires.			4 Wires.			5 Wires.		
	Cwt.	qr.	lb.	Cwt.	qr.	lb.	Cwt.	qr.	lb.	Cwt.	qr.	lb.
No. 6 gauge ...	8	3	0	13	1	1	17	2	20	22	0	11
No. 8 gauge ...	6	0	16	9	0	24	12	1	4	15	1	12

Tying and repairing wire, 14, 16, and 18 gauge, run from 2,322, 3,894, 6,560 yards per cwt. Wire netting runs from 17 to 32 cwt. per mile.

CATTLE AND SHEEP FENCE.

To be perfectly sheep and lamb proof, the fence should be 3 feet 6 inches in height. The lowest wire should be 6 inches from the ground, and many draw a plough-furrow, throwing up a 3-inch sod, which reduces the space to 3 inches between the ground and the lowest wire. The next four wires should be 4 inches apart, the sixth 5 inches from the fifth, the seventh 6 inches from the one below it, and the eighth 9 inches higher. This gives a height of 3 feet 6 inches securely wired. The posts should be 4 feet 8 inches above ground (if the fence is meant for cattle and horses as well as sheep), and 18 inches in the ground. As a safeguard against cattle and horses, a ninth wire, barbed, may be placed, 1 foot apart from, and above the eighth wire, making the total height 4 feet 6 inches.

Sheep and cattle wires may be of 10 to 12 gauge.

For cattle only, the lowest wire (barbed) may be 24 inches from the ground, the second 14 inches above the lowest, and the third 12 inches above that again (all barbed). A plain wire may be placed between them, but it is not necessary, as even two barbed wires are sufficient to deter bulls from breaking through, unless, of course, the cattle are stampeded, in which case no fence is of any use. De Wet's cattle in the Boer war burst through 9 feet of interlaced barbed wire entanglements.

PIG-PROOF FENCE.

None of the above fences are proof against pigs. They will squeeze under or through very small spaces between wires, even though barbed. The only wire fence of any use is Mitchell's K fence. No pig can get through it.

COMPARISON OF THE AGRICULTURAL AND PASTORAL PRODUCTS OF GREAT BRITAIN AND AUSTRALIA.

Untravelled Australians and Australians who do not read are very prone to belittle the agricultural products of Great Britain. They cannot imagine how it is possible that the little British Islands can raise more cattle, sheep, horses, pigs, wool, and general agricultural products than the vast territories of the States of the Commonwealth of Australia. Victorians especially hug the fond delusion that theirs, being the most populous Australian State of all for its size, is a positive "little wonder" of productivity. But let them examine the following table showing the comparison between the products of Victoria and

other States, agricultural and pastoral countries, and Great Britain, which does not rank as a farming community at all, amongst the nations:—

—	Great Britain.	Victoria.	New South Wales.	Queensland.	South Australia.
Sheep	25,257,193	11,455,115	39,506,764	14,872,413	6,277,812
Cattle	6,987,020	1,737,690	2,337,973	3,390,421	304,027
Horses	1,572,433	385,513	506,884	450,675	197,099
Pigs	2,424,910	273,682	310,702	106,633	117,762
Wheat (bushels)	58,902,000	23,417,670	20,737,200	2,436,799	20,143,798
Oats (bushels)	116,437,000	7,232,425	883,081	70,713	869,146
Barley (bushels)	58,110,000	1,062,139	111,186	510,557	505,916
Potatoes (tons)	3,763,000	115,352	50,086	19,231	20,328

Great Britain produces all this wealth, of course (and thinks absolutely nothing of it), because she has a prodigious population to feed. Because of her population, industry, and enterprise, Britain is the supreme nation of the world; because of its lack of population, supineness, and feeble agricultural productivity, Victoria is a puny, inconsequential State, and so will remain until the necessary people are secured and the lands attacked by a vigorous farming community.—English Exchange.

We like the expression "feeble agricultural productivity" as applied to Victoria. The soil of Victoria is very fertile in many districts, and produces crops equal to those of any other State of the Commonwealth of Australia. The writer is evidently no lover of Victoria, hence his ungenerous remarks. We quite agree with the necessity for immigration and the occupation of the land by a vigorous farming community. When this is accomplished, the 87,884 square miles of Victoria will probably not come far short in point of production of the 121,027 square miles of the British Isles.

SMOKELESS COAL.

THE LATEST INVENTION: COALITE.

If all that is claimed for the new invention coalite can be depended upon, we are about to witness one of the most wonderful scientific triumphs of the century. Mr. Thomas Parker (presumably the well-known electrician and engineer) is stated to have patented a new system for eliminating from the ordinary bituminous coal all its smoky gases, a principle which, of course, is as old as coke itself. Indeed, it is said to be difficult to tell the difference between coke and coalite, but, while the first-named substance takes forty-eight hours to produce, the new product can be made out of coal in six hours. Full particulars of the process do not appear to have been made public, but independent confirmation of the success achieved by the inventor is afforded by the report of the Smoke Abatement Society, which officially states that "coalite is a fuel suitable for burning in ordinary open grates, and an efficient remedy for the smoke nuisance." Mr. Parker himself claims to have discovered how to treat coal of any size and quality in such a manner as to extract completely from it the whole of the elements which give rise to smoke and at the same time increase its value as a fuel.—"Indian Trade Journal."

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 30TH MAY, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Sue ...	Grade Shorthorn	22 April, 1907	796	4·5	40·26	
Chocolate ...	Shorthorn ...	5 Mar. ,,	784	4·0	34·99	
Rhoda ...	Grade Shorthorn	12 Mar. ,,	627	4·0	28·02	
Lowla ...	Ayrshire ...	25 Mar. ,,	660	3·8	27·95	
Pee-wee ...	Holstein Sh'rth'rn	6 April ,,	726	3·4	27·41	
Lass ...	Ayrshire ...	19 April ,,	638	3·8	27·01	
Renown ...	,, ...	27 Mar. ,,	569	4·0	25·43	
Blank ...	Jersey-Ayrshire	4 Feb. ,,	510	4·4	25·20	
Hettie ...	Ayrshire-Sh'th'rn	27 Mar. ,,	583	3·8	24·67	
Poppie ...	Grade Guernsey	24 Feb. ,,	487	4·0	21·78	
Dripping ...	Holstein Sh'rth'rn	28 Nov., 1906	425	4·4	20·98	
Winnie ...	Shorthorn ...	11 Sept. ,,	355	5·1	20·27	
Vixen ...	,, ...	25 April, 1907	425	4·4	20·98	

Cows received 15 lb. oaten and 15 lb. lucerne chaff (steamed) per day.

TREATMENT OF MILK FEVER.

In an article in the "Live Stock Journal" on "Home Treatment of Ailments in Cattle," "Spero" writes:—

It seems only reasonable to urge on every stockowner the advisability, and even the duty, of acquiring at least some fundamental knowledge of the more common diseases to which his stock are always liable, and a very limited amount would enable him at once to see whether or no professional aid was necessary. It should also prove a safeguard against the dangers of ignorant blundering, of which the following is a striking example:—A valuable draught mare was suffering from simple colic, and the owner gave a dose of spirit of turpentine in linseed oil, which was administered through the nostril, with the result that she died instantly from suffocation.

Above all, we should never forget that prevention is better than cure, and there is one terrible foe to the cattle-breeder whose attacks are frequently fatal, but who can be kept at bay by preventive treatment. I allude to splenic apoplexy, milk fever, or, as it is commonly called, "dropping after calving."

At the risk of raising a smile, I will say at once that the treatment is homœopathic, but, whatever it may be called, there is the strongest possible evidence of its efficacy. Deep-milking Jerseys are said to be peculiarly liable to the disease, and the following was the experience of the late Mr. Geo. Simpson, of Reigate. He had many cases which ended fatally, and his celebrated cow, Bessie, "fell" no less than three times, but fortunately recovered. I am not aware what gave him the idea, but he was induced to try small doses of aconite alternated with belladonna. Commencing immediately after calving, he administered ten drops of the mother tincture every four hours till four doses of each drug had been given. The result was complete immunity from further attacks. Having learned this from him, I followed his example in the large herd of Jerseys I then possessed, and the treatment was equally successful, for I never had a case of milk fever afterwards. The homœopathic doses of the above powerful drugs are perfectly safe, and the cost is next to nothing, for a sixpenny bottle of each is sufficient for several cows. The marvellous action of these medicines has been explained to me as follows:—Aconite has been called the homœopathic lancet, as in minute doses it lowers the action of the heart, and by this means relieves the pressure on the blood-vessels of the brain, which is the cause of splenic apoplexy.

MANAGEMENT OF DAIRY COWS.

IMPORTANCE OF GOOD WATER.

At a recent meeting of the Glasgow and West of Scotland Agricultural Discussion Society, Mr. Alexander Millar, Huntley Farm, Dundee, read a very practical paper on dairy cows and their management. In the course of his remarks on the management of cows, he said:—Cows in the summer months suffer greatly from heat and flies. I have known a drop of 20 gallons due to a single day's galloping. It may seem a paradox to say that cows require shelter quite as much in summer as in winter, but it is a fact nevertheless, and anyone who will endeavour to supply them with shade will be well repaid for his trouble. Clumps of trees, tall hedges, and even sheds are a good investment in this line. Though well-trimmed hedges look neat on a farm, I think the cows would much prefer them a bit rough. The torment which cows suffer from clegs, warble flies, and such like, is so great during bright sunshine that something ought always to be done to relieve them. In addition to shade, it is also of special importance that they should have plenty of good water. When we remember that milk contains 87 per cent. of water, and that a cow will use up for milk-making purposes alone from 3 to 4 gallons daily in the flush of yielding, over and above what is required in the vital processes of digestion, we can understand that the water supply must not be scrimp. The best supply is in the form of a running stream or river—those farmers who can command a running water into which the cows can go and stand in the shade of the trees during the hot part of the day are much to be envied.

SALT AT PASTURE.

Another point of some importance for keeping stock healthy is the providing of rock-salt to cows in the pasture fields. In an ordinary cattle ration there is about ¾-oz. of salt, but a milk cow requires a good deal more than that. The milk drains away fully an ounce per day out of the system, and unless this is supplied the ash material of their vegetable food does not yield enough. It is most instructive to watch how regularly a cow will come for her "salt lick" once she knows where it is to be found, and at the end of the grazing season there is a very noticeable difference between cows who have had regular access to salt and those who have not. The management of dairy cows in summer is a comparatively simple matter.

QUICK METHOD OF MAKING DEVONSHIRE CREAM.

In many dairies, says the "Journal of the Board of Agriculture," particularly in large ones, where the sale of clotted or Devonshire cream is considerable, a quick method of producing this article is employed.

Instead of the preliminary setting up of the milk in pans for twelve or twenty-four hours, as the case may be, in order to allow the cream to rise, the milk is passed through a separator. The separator is regulated to take off thick cream, and this cream is then run gently on to the surface of some separated milk contained in tinned or enamelled iron pans. Scalding is then carried out in the usual manner, not less than half an hour being occupied by the heating process. The pans are then rapidly cooled, and the cream obtained in a thick clotted condition. Where there is a separator this is a very good way to make clotted cream, especially in summer, when it may always be obtained sweet. In hot weather, if the milk has to stand for several hours for the cream to rise, there is a danger of souring taking place.

DOES ENSILAGE FEEDING FLAVOUR MILK?

Experimental results and practical experience have alike been favourable to the economy of this method of utilising crops where dairy farming is conducted on a scale at all extensive. From time to time, however, objections have been raised to the use of silage, on the ground that it imparts an unpleasant or disagreeable flavour to the milk.

In connection with this subject, experiments were recently conducted at the Illinois Experimental Station. The dairy herd was divided into two lots, one of which were fed 40 lb. of maize silage per cow daily, while the other lot was fed only clover hay and grain. The milk from each was standardised to 4 per cent., and otherwise cared for in exactly the same manner. Samples from each lot during the course of the experiments were submitted to 372 persons for an opinion as to any difference in the flavour of the two samples, anything objectionable about either, and any preference. The results showed that 60 per cent. preferred silage milk, 29 per cent. non-silage milk, and 11 per cent. had no choice. When the silage was fed at the time of milking, the percentage in favour of silage milk was much higher than when the silage was fed one hour before milking or after milking. Five samples of each lot were sent to milk experts in different cities, three of whom preferred silage milk, one non-silage, and one had no choice. No complaint was received from a hotel to which silage milk was delivered for a period of one month. On the whole, it was apparent that the greater number of people were able to distinguish between the two kinds of milk, but found nothing objectionable about either kind.

This is strong evidence that if the silage is of good quality and used in reasonable amounts, in connection with other feed, it is one of the best feeds obtainable for dairy cows when pasture is not available. It must be remembered that in all of this work nothing but good silage was fed, and no spoiled silage was allowed to accumulate in or around the silo. When silage imparts a bad or disagreeable flavour to the milk produced from it, almost invariably the cause is that the silage has not been fed properly, or that spoiled silage has been used.

It should not be understood from this discussion that the time of day a food is fed which may impart a bad flavour to the milk is of no consequence. All feeds of this nature should be fed after milking, and not before, to avoid the possibility of producing an unpleasant flavour in the milk.

It may be concluded that these results are in accord with the statement that "it is now generally recognised that, with the improved modern methods of using silage and with proper precautions to prevent the milk after it has been drawn from the cow from being tainted with the objectionable odour of badly fermented silage, the material may be freely used without danger of injury to the quality of dairy products."—Exchange.

THE NEED FOR SILOS.

Notwithstanding all that has been written in this Journal and in the daily Press on the subject of the great value of and imperative need for silos on the farm, and notwithstanding also all the advice and assistance given in this direction by the Department of Agriculture and Stock, the majority of farmers are still as far as ever from realising how valuable an adjunct the silo is to the farm. Last May, after a few weeks of dry weather with only intermittent showers, when the natural grasses had begun to wither, and very little fodder was to be found on many farms for the dairy stock, the supplies of cream to the factories fell off to a very considerable extent, and as a consequence the farmers grumbled at the reduced monthly cheque. There is scarcely a farm which is not rich enough to produce large quantities of maize, oats, lucerne, and other green crops, which make such admirable silage. And it was in the power of most farmers to provide a building, or even a stack, which would have given them ample food for their stock, and so have aided in keeping up the productiveness of the cattle in the shape of milk. On this subject the Silverwood Dairy Company wrote in May last to its suppliers as follows:—

One of the regrettable features of the present dry weather has been the demonstration of the utter helplessness of the dairy farmer. In spite of all that has been written about the value of food conservation, no heed has apparently been given to this all-important subject, and we have the spectacle of a

few dry weeks destroying the farmers' source of income, and reducing the output of cream to almost an unpayable point. This serves to bring into strong relief the absolute necessity of doing something to minimise the bad effects of these dry spells, which will recur as part of our weather conditions, and farmers can safely count upon getting them again. During the past summer there has been abundant opportunity for farmers to put away a large amount of feed at the very minimum of cost, which, at the present moment, would have served to arrest the downward career of cream output, and of course suppliers' income at the same time. If a good stock of ensilage had been available, this shrinkage of output would have been gradual as the cows dried off in a natural way.

We recommend our readers to study the specifications for a 100-ton silo in another part of this issue of the Journal.

FEEDING OF BREEDING SOWS.

In rearing breeding sows the object is not to fatten them, but enable them to develop healthy frames. Rearing pigs depends so much on the constitution and qualities of the sow. The constitution is transmitted in great measure to her offspring; hence the necessity for careful rearing of the young sow with a view to forming bone and muscle. Food of a starchy or sugary nature should be given sparingly. Skim-milk, bran, pea or bean meal, and oats may be safely given in addition. Too great stress cannot be laid on this when one considers the large litters often reared by one dam. Flesh-forming foods should not be given at any stage. When in pregnancy occasional drinks and feeds of oats are found sufficient; these may be supplemented a few weeks before her time by occasional diets of bran, brewers' grains, or a drink of oatmeal, specially prepared.

The drain on the system of the sow during the period the young are suckling must be met by a liberal supply of food. The growth of the litter depends entirely on the quality and quantity of the mother's milk. Regular diets of these foods mentioned, varied as much as possible, if the pig is healthy, should bring on the young ones, so that when about three weeks old these may be induced to take skim-milk with bran or oatmeal in it. When about seven or eight weeks old they are finally weaned. Some breeders do prefer to suckle the pigs till ten weeks, as it gives them a better start. These, if sold as slips immediately after, do fetch better prices. If kept for fattening they are better suckled right through. Young pigs want a good start in developing bone and muscle, and the food should be arranged accordingly.—"Agricultural Gazette," London.

SORGHUM-POISONING.

A very important discovery with regard to sorghum-poisoning, which is due to a similar glucoside, was made by Dr. S. Avery, chemist of the Nebraska Agricultural Experiment Station, who has shown that carbo-hydrates (sugars, as glucose, milk sugar, and molasses) act as an antidote against the poisonous action of prussic acid and the prussic acid yielding glucoside. The presence of sugars in the first place retards the action of the enzyme in liberating free prussic acid; and, again, prussic acid unites with sugars to form less poisonous addition products. Dr. Avery recommends, therefore, to give to an animal suffering from sorghum-poisoning, in a case that its condition still allows medical treatment, a strong solution of glucose syrup or molasses; or, again, a large quantity of milk. Actual experiments have shown that an animal could be given a large dose of pure prussic acid, up to three times the fatal dose, if glucose was given at the same time; the animal became very sick, but still recovered. Our farmers have, therefore, a very safe remedy in molasses from our sugar-mills, which in many cases is allowed to go to waste, although it is a very valuable fodder for cattle and horses. It can be, therefore, strongly recommended that, when green sorghum, sweet potato vines, or chaff made from these and similar fodders are fed, they should be sprinkled with molasses.

The Horse.

SHOEING THE HORSE.

PRIZE ESSAY IN "AMERICAN BLACKSMITH."

The growth of a horse's hoof is like a finger-nail, and unless it is worn off at the bottom or bearing surface it becomes too long. If worn off too much, the sensitive portions of the foot do not have sufficient protection, and the horse goes lame. In a natural state, however, the horse's hoof keeps itself perfectly proportioned. If the ground is hard, the horny portion is worn away as fast as it grows. All shod hoofs become overgrown in from four to five weeks. In such cases there appears to be an excess of horn at the toe, and since the horny fibres do not grow straight down, but obliquely forward, the plantar surface of the foot is carried forward. This throws it out of proper relation with the rest of the foot, and injuriously affects every part of the foot; in fact, the entire leg may bear directly upon it.

On an average the wall will grow an inch in three months. The more actively a horse is exercised the faster the hoof grows, and inflammation checks growth. If there is no bearing on a certain part it will grow quickly, and become even with portions that receive the bearing. If the hoof be broken or rasped away to relieve pressure, in a month's time that part will be found in all probability flush with the shoe. The sole grows in the same manner as the wall, but it wears away quite differently. It never becomes overgrown, like the wall, for it becomes flaky, dry, and brittle, then breaks and falls out. When the frog comes in contact with the ground it wears off in shreds. The horn of the frog is softer than that of the wall or sole, and stands wear as well as either of them. As it is elastic and rests upon a still more elastic cushion, it yields and leaves the wall and sole to bear the strain.

The growth of the frog depends largely on the condition of the bars. If these are overgrown the frog receives no bearing, and wastes away. High heels are always accompanied by a small frog, and low heels have a large frog. Horn is porous, and absorbs water readily. If too much water is absorbed the horn is, of course, weakened. The natural protection of this is the varnish-like outer wall, and when this is removed by rasping moisture is more easily absorbed, until the horn beneath becomes hard and brittle from exposure and friction, as we have already said. Horn is a poor conductor of heat; therefore, if the horn is thick, fitting a hot shoe for a reasonably short time does no harm, but it is not well to follow this practice. It is very important in shoeing a horse that the bearing surface of the foot on which the shoe is placed be perfectly even, and that the horn be of equal height on both sides. If one side is trimmed off more than the other, the side of the wall left too long will, in time, become bent, and a crooked hoof results, in which the rings are placed nearer together on the low or concave side than on the high or convex side. The toe, also, if left too long, will in time become bent, and heels which are left too long will in two or three months contract just under the coronary band or curl inward at the lower borders.

Wear on the hoof is affected by the position of the legs. As there are badly-formed bodies so also are there badly-formed hoofs. The form of the hoof depends largely upon the condition of the limb. A straight limb has, as a rule, a well-balanced, regular hoof, while a crooked limb has a hoof to match. A plumb-line dropped from the middle of the shoulder-blade divides the fore leg into equal parts above the fetlock, and touches the ground just back of the heels. The line formed by the three phalanges of the foot should form an angle of 45 to 50 degrees with the ground.—"New Zealand Farmers' Weekly."

Poultry.

A DARING THEFT OF POULTRY.

Although poultry-breeders in Queensland are constantly sending valuable birds to egg-laying competitions, as well as to customers in various parts of the State, in no case have the birds been tampered with or stolen. But the "New Zealand Farmers' Weekly" tells of an impudent theft of valuable birds in New South Wales, as follows:—

One of the most daring poultry steals ever perpetrated was that of a pen of six pullets, of a heavy laying strain, on their way to the Hawkesbury Agricultural College, where they were to engage in the Australian Government's laying tests. The six fine pullets were taken from their hamper and six scrubs substituted, but the theft was not discovered until nearly eight months later, all owing to the failure of Mr. G. Howell, the owner, to visit the pens of layers in the Government poultry yards.

[Had these six scrubs reached the Queensland Agricultural College, the fraud would have been detected in ten minutes after arrival, and the owner would have been promptly advised by the Principal. It would take a clever thief to hoodwink Mr. Mahon or his poultry expert.—Ed. "Q.A.J."]

DUCK EGG INCUBATION.

The method of incubating duck eggs as practised by the Chinese of Hawaii (says the "Hawaiian Forester") is somewhat peculiar. A special room is devoted to this use, within which a bin is built, about 3 feet high, running round the room. Within this receptacle are placed ordinary wooden barrels lined with felt paper. The eggs to be hatched are spread on trays in the sun until they attain a temperature of from 102 to 103 degrees. They are then placed in the barrels, layer upon layer, a thin cloth being inserted between each, and a heavier cloth covering the whole. The eggs are turned regularly by removing the layers of cloth one by one, with eggs upon them, and by replacing first the one taken from the top of the barrel. At the proper time the eggs are removed from the barrels and placed upon trays on racks above the bin. As soon as they are hatched the young birds are sold to the large ranches, at the rate of about 50 dollars per thousand.

DETERIORATION OF THE BRAIN OF DOMESTIC ANIMALS.

A writer on natural history recently remarked that the brain of every domestic animal deteriorates. He cites, as example, the feral horses of Australia, which, having to think for themselves, become as intelligent as the wild creatures among which their lot is cast; but he gains intelligence at the expense of beauty and many other qualities valuable to man. Most wild horses are large of head and inferior in physique to domestic horses. The domestic horse must inevitably lose his intelligence, as "those that give up thinking and submit to their masters' orders, and carry out his requirements as to beauty, strength, and speed, are the most useful and most highly prized, and therefore the most likely to be allowed to perpetuate their species." The brains of cattle and sheep and those of the domestic duck have deteriorated from subjection to man.—"Live Stock Journal."

The Orchard.

PREVENTING THE DECAY OF RIPE FRUIT.

If any process can be discovered by means of which Queensland fruits can be delivered in perfectly fresh and saleable condition in the London market, that process will not only be a great boon to orchardists, who are now being so heavily penalised in the Victorian and South Australian markets, but it would give a great impetus to the fruit-growing industry in the State. Year after year we see many tons of fruit, especially mangoes, lying rotting under the trees, or else being destroyed with a view to suppressing the fruit fly. If this fruit, carefully inspected and graded, could be landed in good order in London, orchards would be planted in all directions, for Queensland can not only produce tropical fruits, such as pineapples, mangoes, custard apples, bananas, papaws, &c., to perfection, but our orchardists are equally successful in producing all the European fruits, such as apples, pears, plums, apricots, peaches, cherries, grapes, oranges, walnuts, strawberries, and many other fruits of temperate and cold climates. In December, 1905, we reprinted an article from the "Journal of the Board of Agriculture," giving an account of experiments which had been successfully carried out in preventing the decay of ripe fruit by dipping it in commercial formalin (formaldehyde, 40 per cent.). This was followed in January, 1906, by an article taken from the "Natal Agricultural Journal," pointing out that fruits treated with formalin had been sent to Maritzburg, and arrived in such bad condition that the process was pronounced an absolute failure. In 1905, Mr. W. H. Parker, of Glen Retreat Orchard, Brisbane, suggested similar treatment of fruit, and a consignment was sent by the Government Fruit Expert, Mr. A. H. Benson, to the Citrus Fruit-growers' Association, who forwarded it to Melbourne, with a request that the agent there would report on the condition of the fruit on arrival. This the latter neglected to do, and since then no further experiments in that particular way have been made in Queensland.

During the season 1907, a second series of experiments has been conducted at Kew, for the purpose of checking the results previously obtained, and of experimenting with other kinds of ripe fruit. No special selection was exercised in procuring the fruit for experiments. The plums, cherries, grapes, and pears were purchased at a local fruit shop, and the gooseberries and bananas were obtained from a street vendor. In each case a certain portion of the fruit was treated with formalin; this was placed alongside an untreated portion on a plate of glass; the two were covered with a bell-jar, and exposed to the ordinary temperature of the laboratory.

The following table shows the number of days that treated fruit remained perfectly sound and free from mildew, after the untreated check fruit had become covered with mould and quite unfit for use:—

Plums	Damson	9 days
	Victoria	5 ,,
Bananas		10 ,,
Currants	Black	5 ,,
	Red	4 ,,

The following table shows the kinds of fruit used last year for testing the preservative properties of formalin, and indicates the number of days during which treated fruit remained perfectly sound, after the check or untreated fruit had become unfit for use. The first column of figures refers to last

year's experiments, the second column to this year's corroborative experiments:—

Cherries	7 days	8 days
Gooseberries	7 „	6 „
Grapes	4 „	6 „
Pears	10 „	9 „
Strawberries	4 „	5 „

It is important to remember that all the kinds of fruit experimented upon were quite ripe, and had been exposed for sale, and were, consequently, exposed to infection, and that in some instances they were more or less bruised. With fruit carefully gathered and treated at once, the duration in a saleable condition might be anticipated to extend over a longer period than is indicated by these tables.

In the case of apples that are just pitted with disease, treatment with formalin proves of service. Apple-rot, caused by the fungus called *Glœosporium fructigenum*, Berk., is very destructive to ripe fruit, on which it first appears as minute scattered spots on the skin; these spots rapidly extend and form large, brown, sunken patches; within a very short time this fungus reduces the fruit to a brown, rotten mass. A dozen apples showing the first stage of this disease were immersed for a quarter of an hour in a solution of formalin of the strength given above, and afterwards dried. This was done during the last week in August; the spread of the diseased spots was completely arrested, and the apples are still—end of November—in good condition. A dozen similarly affected apples, collected at the same time, but not treated with formalin, were completely rotten by the end of September.

By employing the method of treatment described, pitted or slightly diseased apples can be kept in a condition fit for use for several weeks longer than when no treatment is applied. This is a point of some importance, both to grower and fruit-dealer. In the case of cottagers, and others who store a certain quantity of apples for winter use, it would well repay the very small cost and trouble incurred to treat apples previous to storing. The method is simple: Put 10 gallons of water (preferably rain water) into a cask or a zinc bath, add 3 pints of formalin, mix thoroughly; then immerse as many apples, contained in a net or loosely-woven sack, as the water will cover. The fruit, after remaining in the solution for ten minutes, the sack being partly lifted up two or three times to ensure every part of its contents coming in contact with the liquid, should be removed from the sack and placed on a layer of straw, hay, or some suitable substance, to drain and dry. It is not necessary to immerse in water, after their removal from the formalin mixture, apples that are intended for storing. Plums, strawberries, and other soft fruits should be placed in a sieve or some such firm, open structure, for immersion in the solution.

The strength of the formalin solution does not deteriorate by use, so that the process of sterilising batch after batch of fruit can be continued until the solution is practically used up in the process.

FOR TROPICAL FRUITS.

However valuable the method of fruit preservation described here be in extending the duration of ripe fruit in good condition at home, the greatest benefit, as stated in a previous report on the subject, will be in connection with imported fruit. Many kinds of tropical fruit that, owing to their rapid deterioration and decay, never reach our shores, could be introduced if treated in this manner before shipment. The fact that many tropical fruits decay very quickly in their native country is in reality no argument against the suggestion. It only indicates that in their native countries, as in this and every other land, the surface of every ripe fruit is loaded with the spores of fungi, wild yeasts, &c., which attack the tissues and set up a fermentation that

is often mistaken for the normal decay due to over-ripeness. As an example, the state of semi-decay in which bunches of bananas so frequently reach us is in most instances entirely due to the attacks of various superficial organisms capable of inducing fermentation. This could be prevented by the adoption at the port of shipment of the treatment recommended above.—"Journal of the Board of Agriculture," Vol. XIII., No. 9.

THE PRESERVATION OF FRESH FRUIT.

In a recent issue of the "Bulletin de l'Office du Gouvernement General de l'Algerie" appears an article on the preservation of fresh fruit on long journeys. Accounts are given of experiments that have recently been conducted, and from them it appears that peat or turf has been found to be eminently suitable as a means of preserving fresh fruit.

The attention of hygienists has been attracted to this substance by reason of its sterilising properties, constituting, as it does, a medium unfavourable to the development of bacteria. The existence of such qualities will secure for peat a large sphere of usefulness.

It is, however, in the preservation of fresh fruit that this substance will be more particularly used. Experience has shown, it is said, that it is superior to every other substance for the preservation of vegetables and fruit which have to survive long voyages.

Among other experiments, it is mentioned that, at the beginning of last year, eleven packages of about 11 lb., containing oranges, mandarins, and lemons, were sent by parcels post from Palermo, in Sicily, to Togo, a German colony in Africa. Fruit were sent in reed baskets, packed in fruit-paper and peat. Envelopes of silk paper were used to keep the fruit humid. Each parcel contained eight oranges or twelve mandarins. There being no direct communication by sea between Mediterranean countries and Togo, the consignment had to travel *viâ* Hamburg. At Togo the parcels were kept awhile before being forwarded to their final destination—a town in the interior of the colony, at a distance of over 230 miles from the coast.

The packages that arrived in the soundest condition were those which were considered most liable to damage, and which were only protected by a rough covering of interwoven reeds. It was observed that the fruit enclosed in boxes covered with tinplate as a rule showed traces of moisture.

Out of 45 fully ripe oranges packed at Palermo, 41 arrived at their destination in a perfect state of preservation, after a voyage of 55 days. The mandarins, generally speaking, also kept well.

The same method of packing was tried in the transport of young trees. The great difficulty was to keep them humid whilst protecting them against moisture. The attempt had been made several times without success to import plants from nurseries in Egypt. By using peat, however, success was ensured. So satisfactory were the results obtained, that it is proposed to import orange-trees into German East Africa from French possessions.

These experiments, it is observed, have shown clearly that peat is an invaluable means of preservation in the packing of fresh fruit. Exporters of fruit will be able, by the use of this substance, to purchase when prices are at their lowest, and keep their fruit until sufficient quantities are obtained to make large consignments; and the employment of the new preservative will permit, in the same way, of fruit being gathered and kept for consignment in large quantities to local markets.

Mr. Melmoth G. Kelly, the Acting Conservator of Forests, after careful investigation, is of opinion that, provided the fruit was properly picked and handled, well sweated, and carefully packed, there appears to be nothing very extraordinary in the test described. The loss was just under 10 per cent., which Despeissis states is the average loss for curing and long keeping.—"Natal Agricultural Journal."

THE UVIOL LAMP.—DESTRUCTION OF THE FRUIT-FLY.

The Uviol lamp is worked by means of mercury vapour. It has a deadly effect on insects. A common fly dies within one minute when brought to a distance of 1½ centimetres of the lamp, a distance at which the heat is not sufficient to be harmful. Under a lamp suspended near an open window at night in summer, thousands of small dead insects could be swept up in the morning. The lamp also exerts a fatal action on bacteria. It may be used for 1,000 hours continuously without deteriorating. The above, which we take from the "Scientific American" of 9th March last, would appear to be well worthy of investigation by orchardists. A light which produces instant death to all insect life brought within less than an inch of its rays might possibly be the means of exterminating the fruit-fly. We know nothing about the lamp or its cost, but doubtless if the above-mentioned journal were communicated with fuller particulars might be obtained. The fruit-fly only works by day, but the fatal effects of the lamp are said to be exerted as well by day as by night.

"THE FRUIT WORLD" ON THE FRUIT-FLY.

The publicity given by the Press to "Fruit Fly," and especially the Press that acts as the official mouthpiece of protection without sense, is to be very much deplored. If one have a disease, or complaint, consumption, heart disease, &c., it is not necessary to shout it from the housetop; if a suburb be not in good sanitary condition the council does not publish it abroad; it gets to work making conditions sanitary without telling anybody, and thus people still buy, build, and trade, with the result that the standard has not been lowered in that locality. It is a wise policy always to advertise your good points and to hide your faults whilst seeking to mend them.

DO NOT ADVERTISE YOUR DISEASES.

In the present case of fruit-fly, the publicity given has caused restrictions on exports from Victoria. This will probably be found in New Zealand, Tasmania, and South Australia in due course, and already some European representatives have made inquiries.

There is danger here. An overcry in the matter may injure the export trade in apples, pears, and citrus (we emphasise citrus, because an export trade will be established).

Any ensuing restrictions would be because of the disease, and must not be confused with the restrictions adopted against Victorian fruit, because of Victorian restrictions on imported fruit.

Nearly all the leading growers endorse this view of the matter of publicity.

FRUIT-FLY SERIOUS.

Fruit-fly is undoubtedly the worst pest, but it can be controlled by proper orchard practice; any attempt to remedy matters in the markets alone will be useless to effect a cure at the orchards; it may help the Health Department and the cause of good food. If fruit is condemned in the market, the balance is usually left on the ground. This is the whole sum of the matter—the absolute destruction of all affected fruits.

You must get to the orchard; growers will not send it to market for destruction. If condemned and destroyed, they will keep the fruit at home, which is the worst place to keep it. It is the same argument over again in reference to all diseases in all the States.

If New South Wales is going to attempt to better the conditions in the citrus groves, she must get those four lone inspectors out of the markets into the orchard, and then four men only will be a miserable failure.

FRUIT-FLY CAN BE CONTROLLED.

However, we believe that, by the regular and careful orchard destruction of all affected fruit by boiling or burning in district incinerators, if such were possible, that the fly could be kept under even better than codlin moth.

Our representative has just been through New South Wales citrus groves, and he restates that the reason the fly has grown to such a severe extent is from the fact that the orchards have been specially breeding them without let or hindrance. For years and years the fly has bred in the fruit, for there is nowhere else for it to breed; and it is self-evident that if the affected fruit had been destroyed effectually for all that time that the pest would be very little in evidence. In Queensland there are so many tropical native fruits that this course is not very effective; but in Victoria and parts of New South Wales such practice must be very effective.

We feel sure that by orchard destruction of affected fruits, and by orchard preventative measures, the pest can be reduced to a minimum.

Nothing else can do it.

This is borne out by Queensland and New South Wales citrus-growers.

Prohibition would be impossible. It would mean that the whole Victorian crop would be shut out of Queensland and New South Wales; and the whole loss from the remedy would be worse than the loss from the disease if it is met in a proper manner at the orchards affected by the destruction of all fallen and diseased fruit.

INCREASED INSPECTION FOR LOCAL FRUITS.

The increased inspection facilities and consequent departmental growth is being used for vigilance at local markets, and a large number of fruit-growers have been fined for codlin affected fruits in a season when the best sprays, under Government advice, have failed. If a man has done his very best, and then finds that departmental course a failure, he should not be condemned. If he is, then logically the condemnation is to the Entomological Department, and they should pay the fine.

As it stands, it is most illogical and unreasonable. Moreover, every fine helps to spread the codlin moth at the orchard, for the fruit will be simply left to breed the moth in the orchard.

The right end of the stick is not held in this matter; let it be done the right way, and from one end only, even if it may mean more orchard inspection and more inspectors, under an educative and not a coercive administration.

The cost to the country is nothing. Is the industry not worth it?

ANOTHER NEW FRUIT.

A new fruit which may be worth attention by our nurserymen is described in a recent number of the "Kew Bulletin." It comes from Uruguay, is a sapotaceous tree, and its name is *Pontaria suavis.* The fruit is described as of the size of an apricot, yellow and scarlet in colour, and with a fragrance so delicate that it is equalled by no other fruit, whilst the flavour is extremely agreeable. It has already been introduced on the Riviera (Europe).

NEW TOMATO.

A curiosity in tomato plants is mentioned in the Feilding "Star," the product of cultivation by Mr. Towler, of Feilding, who has grown a new kind of tomato. They are about the size of a large plum, red, round, and of exquisite flavour. Unlike the ordinary tomato, they do not grow in bunches, but in rows along the branches, while they are very prolific, and the production per plant is enormous. The tomato has been named "Towler's Beauty," and it richly deserves the title.—"New Zealand Farmers' Weekly."

Tropical Industries.

RUBBER.

Viscount Mountmorres, F.L.S., Director of the Institute of Commercial Research in the Tropics, Liverpool University, lately delivered three lectures on the subjects of maize, cocoa, and rubber, at the Lagos (West Africa) Agricultural Show, to an audience consisting principally of native farmers and chiefs. The character of the audience necessarily determined the scope of the lectures. The hints contained in these lectures may, however, be of wider interest, and we take that on rubber as being of considerable interest to planters in North Queensland and in New Guinea, where rubber-planting is being carried on on a large scale, although, at present, the industry is only in its initial stages. The Viscount, in this lecture, said:—

Native Rubber Plant.

Now for a word or two about rubber and its preparation on the West Coast. We can roughly divide the native plants giving rubber into two groups—the rubber trees and the so-called rubber vines. The first group is made up of the *Funtumia elastica* or *Ofruntum* and various species of Ficus, or fig: the other group consists of different species of Landolphia, Clitandra, and Carpodinus. The last-named is always included amongst rubber-producing plants, though really it should not be, as there is no kind of Carpodinus which, so far as it is at present known, yields a good rubber. The milk or latex of all species of Carpodinus merely forms a sticky paste, useful as birdlime but good for nothing else, and it would be just as reasonable to call the Oroko, or the bastard Ofruntum, rubber producers as to speak of a Carpodinus as such.

Importance of not Mixing Latices.

If good rubber is to be produced, the milk of none of these—Carpodinus, Oroko, and bastard Ofruntum—should ever be mixed with the milk of the true Ofruntum or the "good vines," such as *Landolphia owariensis* and *Landolphia heudelotii*. Indeed, even the fig family ought to be barred. Much of the bad repute of British West African rubber is due to this habit of mixing true rubber latex with these refractory latices.

The Vines.

Very few of the good rubber vines give a plentiful supply of milk. As a rule, it exudes very slowly, and coagulates or sets as quickly as it exudes. It is, therefore, impossible, or next door to impossible, to collect it in bulk, and coagulate it afterwards.

Tapping.

Also, owing to the irregular and tangled growth of these "vines" they cannot be tapped in any very systematic fashion. All that is usually done at present is to cut gashes all over them, and then criss-cross these gashes with the point of a knife; next, squeeze some limejuice on the wound, and pick off with the finger and thumb the flakes of rubber which form. Wherever possible the milk ought to be collected in bulk, and in some cases this can be done, if no limejuice be used. If the milk is at once diluted with water it will not coagulate for some little time, but care should be taken to use only clean water, as any impurities in the water will help to make the rubber putrefy.

Natural Coagulation.

If the milk does not flow freely enough to collect and take away, the limejuice method may be used, or better still, though slower and more tedious,

is natural coagulation, without the use of anything. The easiest and simplest way of effecting this is to place little cups or pannikins, one under each gash on the vine—small tin basins, or little china saucers, or small calabashes, or even a split bamboo or cup made of a twisted leaf will answer the purpose.

CLEANLINESS ESSENTIAL.

See that whatever it is, is quite clean and dry. Clean the bark of the vine round each spot where you are going to tap it, so that there is no loose bark or dirt to fall into the milk. Fix the receptacle just underneath, and tap the vine. Some latex will drip into the pannikin or cup, and a certain amount will coagulate on the wound. Meanwhile, you can go on making similar cuts on other parts of the vine, and when all have finished running, go round and empty all the pannikins or cups into one. In each a film of rubber will be left. In some cases the whole of the milk will have set.

COLLECTING THE FLAKES AND LAYERS.

Next, pick off the rubber that has coagulated on the wounds. Keep all these little strips and flakes apart, separated as much as possible from one another, so that they do not stick together to form one mass. Leave the liquid in a large flat shallow basin or saucer so that it is spread out into a thin layer. If put aside in the shade it will soon set, and the skin that forms can be removed and placed with the other flakes and strips. Keep on in this way removing the skin layer by layer till no more forms.

DIFFERENCE IN QUALITY OF VARIOUS LAYERS.

There is a considerable difference in quality between the rubber which sets first and the last. The first to set is the best, but unfortunately there is almost sure to be a certain amount of dust and dirt in it, however careful you are, and this spoils its value, so that really the second layer is the most valuable and the last the least so; but it probably would not pay to separate them, as the quantities of each would be too small. Now, all these flakes and strips and layers of rubber collected in these ways must be well dried, and I shall deal in a minute with the drying of rubber.

COAGULATING IN BULK.

By far the best rubber is produced, not by this more or less haphazard fashion but by a careful treatment of the milk in bulk. There are many different processes in force at the present day for coagulating rubber—both that of vines and of trees; but after a considerable series of experiments on the latices of almost all the known species of Landolphia which produce rubber, and of Ofruntum, I have no hesitation whatever in recommending two as being vastly superior to any others. The one of these methods is applicable to Ofruntum rubber, and the other to vine rubber. And I will describe them both.

COAGULATION OF FUNTUMIA RUBBER.

First, that for Ofruntum rubber, which is by means of an infusion of Niama (*i.e., Bauhinia reticulata*. Native names: Joloff, "Nguiguis" ; Toucouleur, "Barkeni"; Saracolles, "Yafe"; Kassouks, "Faro"; Malinkes and Bombaras, "Niama.") The "Niama" is a very common shrub in West Africa throughout the whole of the open country, and in the belt between the dense forest and the open country. Coagulation by means of Niama has already been favourably spoken of by M. Chevalier, after his journey of research in the old colony of the Soudan; it is in current use throughout the whole of that district.

NIAMA INFUSION.

The method of preparation consists in taking a large handful of the green leaves and the young shoots of Niama, and boiling them for a quarter of an hour in nearly two gallons of water. This quantity of water is required to

treat 1½ gallons of latex. The latex must be poured into a perfectly clean vessel, for choice a large earthenware basin or calabash which has been thoroughly cleansed of any dirt it may contain.

How to Use It.

On to the latex the infusion is poured as hot as possible, but not boiling, care being taken to pass it through a piece of quite clean material of some sort, to strain off the scraps of leaves and prevent them falling into the latex. As soon as the infusion has been poured in, the whole mixture is stirred with a wooden stirrer.

Collecting the Coagulated Rubber.

At the end of about five to ten minutes at the most, the rubber coagulates and forms a cake, whitish in colour. This is then removed from the infusion, and strongly squeezed with the hands on a perfectly clean mat to express as much water as possible, then cut into very small strips. If it is desired to form biscuits instead of balls, the coagulum should be plunged into cold water, and then placed on a perfectly flat surface, either a piece of plank or a native stool, and flattened out with a roller. All these operations must be carried out as rapidly as possible, because the rubber quickly hardens when it is removed from the infusion. After taking the cake out of the infusion small yellowish clots will still be seen floating on the surface. This, too, is rubber. In order to extract it, the liquid should be vigorously agitated with a wooden stirrer, about which it will quickly adhere. Finally, when this process yields nothing more, the residue containing the infusion may be poured into an earthenware vessel, boiled and stirred with the stirrer, and in this way every particle of rubber contained in the infusion may be extracted. It is certain that in future one ought to separate the rubbers resulting from each of these operations, because the qualities must of necessity be different.

Coagulation of Vine Rubber.

It must be borne in mind that this process is only good for Ofruntum rubber. There is a somewhat similar process for vine rubbers—or, rather, for *Landolphia latex.* Only in this case the infusion is an infusion of a plant which is very common all over tropical Africa, known in many parts as Bosanga or Boienga. The scientific name of this plant is *Costus lucanasianus.* It must not be confused with the common Costus—*Costus afer*—which has no effect one way or the other on latex of any kind. The infusion is made and used in the same way as in the case of the Niama for Ofruntum rubber.

Grain from Methods Recommended.

Now, I don't want you to take my word alone for the methods of coagulation I have recommended. That recommended for vine rubbers is the one practised on the Upper Congo and throughout the greater part of the Kassai region, and in the Ituri forest, whence originate the Haut Congo and Kassai grades of rubber. That recommended for *Funtumia latex* is that by which rubber is now being experimentally prepared throughout the Ivory Coast, and rubber prepared by natives by this process has been selling on the Liverpool market at 3s. 10d. a lb. against Funtumia rubber prepared by other processes on the Gold Coast at 2s. to 2s. 2d. a lb. A small quantity of about 5 lb. of rubber prepared from *Funtumia latex* by this process, some of it by M. Benquey and some of it by myself, was valued by rubber brokers in Liverpool at 4s. 6d. to 4s. 10d. a lb., with hard Para at 5s. 4d. The difference in value between this and the native prepared being due to (*a*) more careful preparation, and (*b*) in the case of the rubber which I prepared, to smoking after coagulation.

Action of Light.

In the coagulation of rubber, by whatever process it is effected, there are two points to bear always in mind: The first of these is scrupulous cleanliness,

and the second is protection against the direct rays of the sun, or even excessive light. Light, and more particularly direct sunlight, have a very marked ill-effect on all forms of rubber in all stages of its preparation.

POSSIBLE DEFECTS.

In order to be able to prepare a really first-class rubber, we must know what are the chief imperfections to avoid. The first of these is the presence in the rubber of a large proportion of soft resins—that is, resins with a low melting point. Now, there is some very definite chemical relation, which is not yet perfectly understood, between caoutchouc, that is chemically pure rubber, and resin. It is certain that caoutchouc is converted under favourable conditions into resin by oxidation, and that the conditions favourable to this change are warmth and moisture. Both should, therefore, be avoided. This means keeping the rubber when prepared as cold as possible, and also drying it thoroughly. It is obvious that any process of coagulation by means of a boiling or nearly boiling infusion prevents the rubber from containing resins with a very low melting point, since such resins will not solidify in boiling water. So if rubber is in the first place coagulated in this way, it will not at the outset contain soft resins; and if, in the next place, it is thoroughly dried and kept cold, it will not afterwards be changed into resin.

"PUTREFACTION."

The other chief form of poor quality in rubber is "heating" or "lossiness," due to the putrefaction of albumens, proteids, vegetable refuse, and other organic matter present. Obviously the first safeguard against this is to avoid having such organic matter present in the rubber in larger quantities than is unavoidable. The great bulk of this organic matter in any properly coagulated rubber is present in solution in the moisture in the freshly prepared rubber, and the moisture in which it is dissolved in its turn assists and tends to its putrefaction. So that the first essential in order to avoid this putrefaction is, once again, thorough drying. The next precaution is to take steps to prevent the putrefaction of such organic matter as cannot be avoided—that is, to asepticise it. Now, one of the great advantages of the Niama infusion is that, apart from its purely coagulating powers, it is an antiseptic, and rubber prepared by this process is consequently less liable to putrefy than that prepared by plain boiling or by mere exposure to the air.

SMOKING RUBBER.

There is, however, another means of asepticising rubber, which should never be omitted, however it be prepared, and that is—smoking it. The antiseptic virtue of smoking lies in the creosote which is present in wood smoke. All grades of rubber, by whatever process prepared, should always be fumigated.

ITS VALUE AS A PRESERVATIVE.

It is to be noted that all the best qualities of indigenous rubbers come from parts where, either by accident or by design, rubber undergoes a smoking process, in the course of, or immediately subsequent to, its coagulation. Thus, on the Amazon, rubber is deliberately smoked over a fire of Uricuri nuts. In the Upper Soudan and along the Southern Rivers, whence comes the Konakry rubber: in Cassamance, whence comes the Senegal rubber; and in almost every part of the Congo, more especially on the Upper River and in the Kassai region, the rubber is adventitiously smoked by being hung up to dry on the rafters of the native huts. These are dripping with the black oily moisture produced by the destructive distillation of wood on the family hearth, which in these parts is inside, and not outside, the hut. By whatever means rubber is prepared, and whether it be a vine rubber or a tree rubber, there is no doubt that it can be preserved against the putrefaction of organic matters, by being slowly smoked

or creosoted without coming in contact with direct heat. This process must take place when the rubber is in small pieces, in order that the greatest possible surface may be exposed to the action of the smoke, and care must be taken that the rubber is not in any sense of the word heated during the process.

AND ON THE MARKET.

Quite apart from the real benefit derived from smoking, there is a secondary advantage in that it gives to rubber the peculiar smell known as the "smoked bacon smell," which, being associated particularly with the best hard Para, favourably disposes purchasers towards all rubbers possessing it.

DRYING OF RUBBER.

I now come to a most important matter in connection with rubber, and that is—its thorough drying. I have referred to it more than once already as a safeguard against both the formation of resins and the putrefaction of organic matter present in the rubber—the two great causes of poor quality in rubber. You will see, therefore, how essential it is that rubber should be well and thoroughly dried. Now, its drying and its smoking can be carried on at one and the same time by hanging it up for sufficiently long in wood smoke, away from heat.

ADVANTAGE OF SMALL PIECES.

To ensure thorough drying, rubber should always be coagulated in small pieces, preferably in very narrow strips or in very thin flakes. If, however, it is inevitable that a large quantity of rubber should be coagulated in one mass, it should always, without loss of time, be cut up into small thin ribbons, or else into little lumps not larger than the top joint of the thumb. Biscuits or strips are more easily handled and more quickly dried than even the smallest lumps, as they can be more readily hung up in a current of air and offer a larger drying surface per cubic content. If, however, it is necessary to dry lumps, they should be laid out on clean mats or bamboo chits, carefully separated one from another in a shed with open sides, and should be turned at least once every twelve hours until thoroughly dry.

TO PROMOTE AIR CURRENT IN DRYING SHED.

In all sheds used for drying rubber, a draught of fresh air can easily be promoted by leaving the grass long and rank on one side, and on the other side removing the grass and beating down the earth to a clean surface. Rubber in the form of lumps (marbles), strips, or biscuits, should never be made up into "niggers," twists or cakes, or be packed away in large quantities until thoroughly dried all through. This stage may be recognised by cutting the marble, strip, or biscuit parallel to its greatest surface, when the colour of the interior should nearly resemble that of the exterior. In order to avoid prepared rubber from coming under the action of strong light, it should be marketed as rapidly as it is prepared, in order that it may be suitably packed for transport in Europe. On the other hand, it should not be packed away for long with insufficient ventilation in large quantities; and if it is impossible for rubber to be marketed as soon as prepared, it should be kept in a well-ventilated shed or hut in the shade at as low a temperature as possible. Rubber requires dry, sunless air, and plenty of it; moisture and sunlight are bad for it.

Let me just sum up what I have been saying. First, coagulate rubber by the Niama method for Ofruntum rubber, or by the Bosanga method, or else by mere exposure to the air, for "vine" rubber; next, coagulate it in very small pieces, or at once cut it in very small pieces, strips, or flakes for preference. Dry it thoroughly, and smoke it, by hanging, or laying out, these small pieces in a smoky hut. Keep it from strong light, and keep it cool in a well-ventilated shed until you can market it, and market it as soon as possible.

CULTIVATION OF RUBBER BY FARMERS.

Mr. H. Newport, Instructor in Tropical Agriculture, Kamerunga, says:—"The cultivation of rubber is a matter well worthy of consideration. As a product of high value, as an industry particularly adopted to the conditions of labour at present obtaining in this country, as a means of the utilisation of labour during the off season in the sugar districts, and as a product to which our soils, climate, and temperature [in North Queensland.—Ed.] are particularly favourable, it promises to be not only one of the principal, as it is the most valuable, of tropical industries in the world, but also one especially suited for North Queensland as an auxiliary or subsidiary crop for farmers.

"For general information regarding the requirements of and for rubber, I would refer to the 'Queensland Agricultural Journal,' for May, 1907.

"Rubber, of course, in view of the length of time it takes to come into bearing, must be looked upon as a permanent crop. For this reason, areas either unsuitable for, or permanently abandoned after, cane only could be planted with it. The fact of such fields which, for various reasons, are no longer required for cane, having possibly the surface humus more or less exhausted, does not necessarily render them unsuitable for deeper-rooting staples, such as rubber.

"While it would undoubtedly be worth the farmer's while, and the return would certainly warrant the planting up by cane-farmers, of such areas with rubber-trees rather than allowing them to be overrun with noxious plants, I would suggest rather the planting up of odd corners, gullies, roadsides, drives, and even along the fences. The effect on the cane of trees of Para Rubber every 40 feet or so along the fences, either from the point of view of what they take from the soil or the shade they will afford (this rubber is by no means a dense-foliaged tree), will be so trifling that it would not be considered detrimental, while on roadsides and around the homestead paddock, rubber-trees could not detrimentally affect anything.

"In this manner I am confident quite a large number of such useful, paying, and handsome trees could be planted on a farm, and probably several thousands of them, in such a manner as to require no extra expense in cultivating, &c., and, while taking up an appreciable area of the farm, the returns from which by the tenth year amounting as they would to from 10s. to 15s. per tree gross, would prove a material addition to the income of the property."

This is a very excellent suggestion, and we wonder it has not been carried out long ago. Take a rich scrub farm anywhere between Cardwell and Cairns. A farmer clears 50 or 60 acres, which have to be fenced. If, when fencing, he put in a rubber-tree at, say, every half-chain along the fence, he would have from 180 to 200 trees which would be quietly growing during the time he was busy raising sugar-cane or coffee or other tropical crops. In five years they would be ready to tap, and in eight years he would get from £100 to £150 from them with no more labour than is involved in tapping the trees and preparing the rubber. It is just as easy to have rubber-trees growing inside the fences as ordinary scrub trees outside them.—[Ed., "Q.A.J."]

RUBBER IN BORNEO.

The "British North Borneo Herald" remarks:—Tapping on sixty (Pará) trees was commenced at the Tenom Rubber Estate on the 1st of July, 1906, and has been continued on alternate days to date (27th February, 1907), except on such occasions as days when rain fell or the coolie in charge was ill. The yield for these eight months has averaged 15 oz. (15/100 of an oz.) per tree per tapping, or 1½ lb. of dry rubber per tree per annum for trees 5½/6 years old, and with an average girth of 23 inches. The trees are now yielding more latex

and of a greater density than when we commenced, and the only thing which seems to diminish the yield is any cessation of tapping, after which the trees seem to take some days to get into their stride again. None of the rubber has yet been marketed, as the parcel would be too small to be of value.

PROFITS OF THE COTTON TRADE IN ENGLAND.

There appears to be every inducement for Queensland farmers to go in largely for cotton cultivation. Both America and Japan are constantly adding to their cotton-mills, and, consequently, the demand for the raw material is rapidly increasing. On this subject, "Tropical Life" writes:—"Growers of cotton will, no doubt, be glad to hear that the cotton-spinning trade in England is in a most flourishing condition, and prices tend upwards on all classes of goods.

"Buyers, therefore, of manufactured cotton must therefore expect to pay dearer, but those growing the cotton should also be able to realise proportionately higher prices for their crops. Commenting on the situation, the 'Daily News,' of London, says that this, the first quarter of this year, has been one of the most prosperous periods for cotton-spinning companies ever experienced in Lancashire, and large gains have been made; dividends from 10 to 35 per cent. being declared, and large sums written off for depreciation."

It is exceedingly probable that an effective cotton-picking machine, the invention of a Queensland cotton expert, will ere long be placed on the market. We understand that the machine has already proved its capability for picking long stapled varieties, such as Sea Island and Caravonica. Should its powers extend to the picking of Upland cotton, the difficulty connected with picking by hand will at once be settled. Let us hope that the invention will prove a success. We have heard of so many of such machines that we cannot avoid some scepticism on the matter of an invention which, so far, has baffled the most ingenious of inventors.

SEA ISLAND COTTON.

High Prices in the West Indies.

The Sea Island cotton industry has made very rapid strides in the West Indies, and from all accounts growers are making very large profits.

Mr. A. H. Dixon, Managing Director of the Five Spinners' and Doublers' Association of Manchester, the largest users of Sea Island cotton, has just paid a visit to Barbados, and at the invitation of the Imperial Commissioner of Agriculture, he was good enough to place on record his views as to the course that it would be wise to adopt in the further development of cotton-growing in these colonies. It has been abundantly proved that the West Indies can profitably produce the finest qualities of Sea Island cotton; further, that this cotton is in good demand and obtains the highest prices, surpassing even those obtained for the same grades in the Sea Islands. This is due to the fact that in 1903, when the industry was started on commercial lines, the Imperial Department of Agriculture was fortunate enough to secure a sufficient quantity of the best cotton seed from the Sea Islands to plant at once 7,000 acres. The seed was carefully selected and disinfected beforehand and supplied to growers at cost price. The valuable support of the British Cotton-growing Association was also an important factor at that time. It is estimated that there are now nearly 15,000 acres under cultivation in Sea Island cotton, while the value of the exports to date amount to more than a quarter of a million sterling. The prices ruling this season (1907) are exceptionally high (23d. to 31d. per pound). This is owing to the partial failure of the crops in the

United States. It is understood that such prices cannot last. The planters are, therefore, advised to look to lower prices next year, with probably 18d. per pound as the average for the next three years.

In the letter from Mr. Dixon, reproduced on pp. 102-3, attention is drawn once more to the fact that for the highest qualities of Sea Island cotton there is only a limited demand, and the planters are advised that it would be to their interest to realise this, and to devote attention to the production, as a main crop, of a good, strong Sea Island cotton, of uniform length (not exceeding $1\frac{3}{4}$ inches or $1\frac{7}{8}$ inches), similar to what is grown on the mainland in South Carolina and in some parts of Florida. For this grade (selling now at about 18d. to 22d. per pound) there is such a demand as would admit of a large extension of the area under cultivation, without risk of the supply, on an average of years, exceeding that demand.

The advice given by Mr. Dixon is timely, and prompted by motives which will be appreciated by all concerned. The object he has in view has the full sympathy of the Imperial Department of Agriculture, and steps will at once be taken to consider carefully how it can be attained with due regard to the conditions now existing.

Think of these prices, farmers of Queensland! A crop of Sea Island cotton yielding, say, 400 lb. of clean lint worth 2s. 7d. per lb.! Yet, all efforts to induce farmers in this State to soar beyond maize at 1s. 6d. to 2s. per bushel, seems futile.

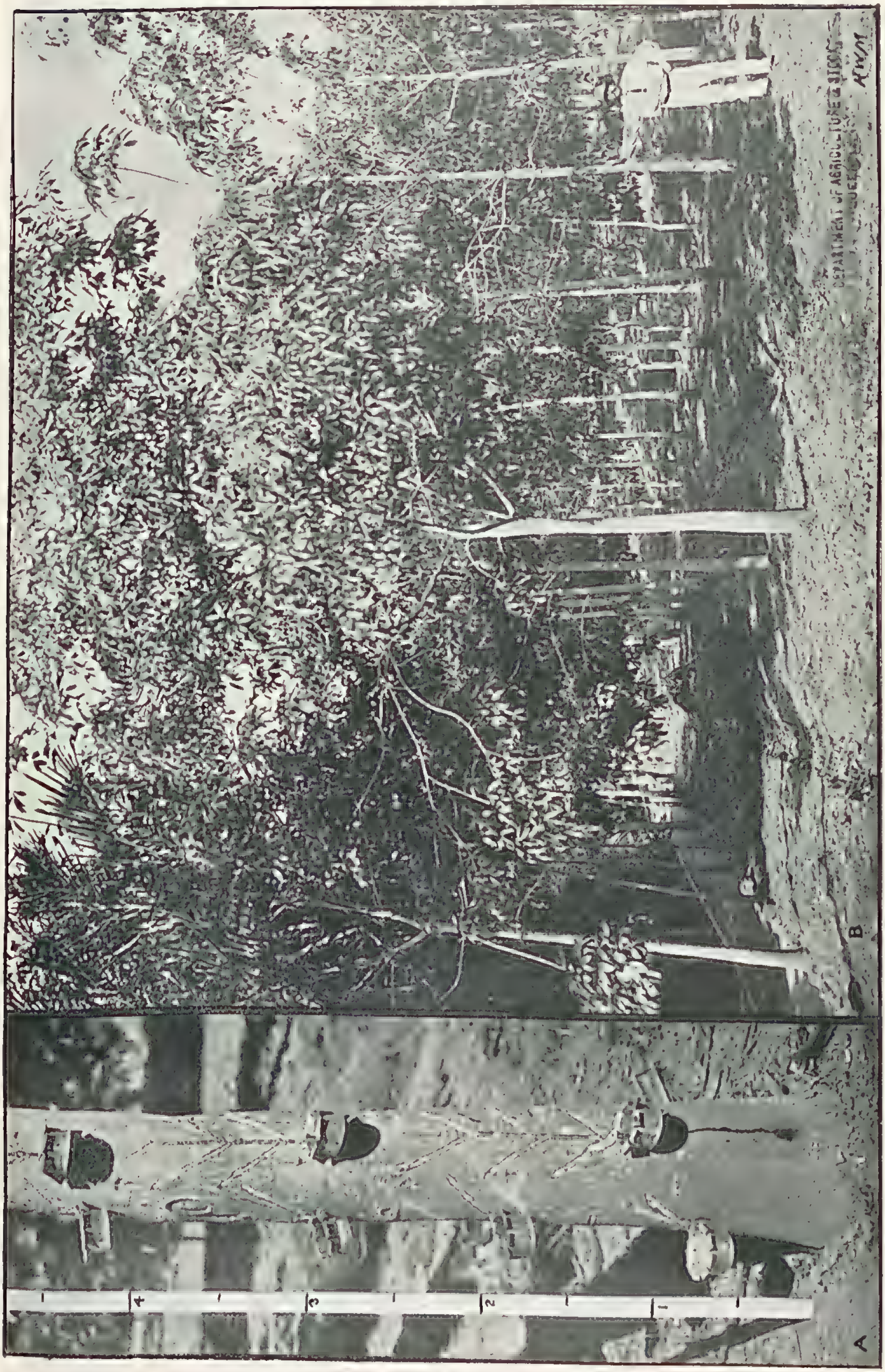
RUBBER AT KAMERUNGA.

The accompanying illustration, taken at the Kamerunga State Nursery, near Cairns, by Mr. W. H. Mobsby, of the Agricultural Department, gives a very excellent idea of the young rubber plantation at the State Nursery. The portion marked B shows the plantation, and on the left of the picture the method of tapping, technically called the "herring-bone system," is very clearly shown (A). The far northern portions of the Queensland coastal scrubs are admirably adapted to rubber cultivation, in consequence of the richness of the soil, the plentiful rainfall, and the tropical temperature. Mr. H. Newport, the Instructor in Tropical Agriculture and Director of the Nursery, has, after much exhortation, at last been successful in inducing farmers to go in for this, one of the most lucrative of all tropical industries, and it is now in a fair way to be established on the rich tropical scrub lands from Cardwell northwards.

CULTIVATION OF FIBRE PLANTS IN PORTO RICO.

From the "Indian Trade Journal" we learn that the growing of sisal is about to be largely entered on. Indian hemp (*Cannabis sativa*) has been tested, but made a very poor and stunted growth. Of the other fibre crops that have been under test, sisal seems to be the most promising from a financial point of view. Maguey grows luxuriantly and is native to the island, but the yield of fibre is small compared with sisal. Sansevieria will make a good growth on certain soils, but the yield of fibre is much below sisal, and the soils that will grow this crop will also grow more profitable crops, like sugar-cane. On high ground that plant makes a very meagre growth. The Insular Government has decided upon taking up the growing of sisal on a commercial footing, setting 100,000 plants under the direction and supervision of the experiment station. The fibre expert of the Bureau of Plant Industry, United States, Department of Agriculture, Mr. Lyster H. Dewey, made a visit to the island in the summer and looked into the fibre situation in different sections. He recommended that a commercial trial be made with sisal as the most promising of the several fibre crops tested by the experiment station. Upon his return to the States, a

Plate II.



Kamerunga State Nursery, Cairns.

A. Tapping a Young Rubber Tree. B. Part of the Rubber Plantation.

box each of sisal and maguey were sent to Paterson, N.J., for extraction in the machines. Mr. Dewey returned samples of these fibres extracted. Commenting upon that from the sisal, he writes as follows:—"This fibre is softer and more greyish in colour than most of the sisal on the market, owing chiefly to the fact that it is from leaves only two and a-half years old, while practically all of the commercial sisal fibre is obtained from leaves at least four years old. This fibre, however, is of remarkably good strength."

"We tried the maguey leaves in the machine at Paterson, but the machine would not clean them in a manner at all satisfactory. The fibre of the Porto Rican maguey is weaker than that of sisal, and the leaves are less firm in texture."

FIBRE-YIELDING AGAVES.

Dr. K. Braun, in "Der Pflanzer" (German East Africa, 1906), gives an account of all the fibre-yielding agaves. The following abstract includes the most important:—

Agave americana, called "Century Plant," American aloe, carata, pite, magui, and blue aloe. The fibre from this plant is called sisal, pite, ixtle, magui, and Tampico hemp. It is cultivated in Mexico, primarily for the preparation of the national drink, mescal. Pulque is prepared from *A. atrovirens.*

Agave decipiens, false sisal. This produces a finer, whiter fibre than the true sisal, but only half as strong It is sometimes mixed by mistake with sisal in Florida and the Bahamas.

Agave heteracantha. The fibre is called pite or ixtle. It forms 90 per cent. of the commercial "ixtle fibre" from Mexico. The fibres are used instead of bristles, and for sacking and rope. The plant is not cultivated in Mexico, and the preparation of the fibre is done by the natives.

Agave rigida, var. elongata; called saqui or henequen. This is the commonest cultivated agave in Yucatan. It has a flower-stem no taller than 5 feet. It is an important fibre plant.

Agave rigida, var. sisalana. This is also called henequen or sisal. The flower-stem is about 20 feet high. It seldom ripens seed, but young plants grow from bulbils on the flower-stalks. It is the most important fibre-bearing agave.

Agave vivipara, called teometl, maguey, Bombay aloe fibre, and Manila aloe fibre. Planted in India, Guam, and the Philippines.

Agave yuccaefolia. The fibres are prepared in South and Central America, and come into commerce under the name of pite fibres.—"Agricultural News," Barbados.

SISAL AND FOURCROYA.

The Director of Forests and Gardens in Mauritius reports in the Natal "Agricultural Journal" that the production of fibre from *Furcraea gigantea* is a paying industry in Mauritius. The leaves can be cut about four years after planting, and then about every year and a-half, till the plants send up their flower-stems with bulbils. One acre gives about 60,000 leaves, producing a ton of dry fibre, which sells in London at £25 to £35.

According to an article in the "Tropenpflanzer" for January, the production of sisal hemp in German East Africa is now over 1,000 tons per annum. It is sold at over £40 per ton. The whole of the product goes to Germany, and seems to replace there the lower qualities of Manila hemp in the manufacture of rope.

A BRISBANE COTTON GINNERY.

The very complete ginning plant here illustrated in this number is representative of the enterprise of Messrs. J. Kitchen and Sons, Eagle street. This firm, ever alert for opportunities to extend their oil manufactures, were among the first to appreciate the value of the Queensland cotton industry. Last season's operations were practically on experimental lines, and the volume of trade was scarcely up to anticipation.

This season, however, prospects of an extended range of business are confirmed by reason of a substantial increase both in yield and area under crop.

The buildings in which ginning operations are carried on are situated in Chester street, Fortitude Valley. The structure, formerly a city brewery, by reason of its architectural character, has proved to be splendidly adapted for its new purpose.

It comprises three commodious floors, connected by staircase and powerful hoisting apparatus, whereby the bales of cotton are conveyed to the higher floors, and thence the fibre, when unbaled, is lowered by means of canvas sheets on to the carrier of the cotton gin. This process, being almost automatic, saves a considerable amount of handling. These three upper floors, being 40 x 40 feet in area, are calculated to hold all the cotton likely to come to hand for some time to come. The basement is a much more commodious area, being 120 x 40 feet, and, if filled, is able to provide storage room for many hundreds of bales of cotton.

The operating plant comprise a gas-engine, two modern cotton gins, two roller gins, and a linter and baling press, also a hydraulic dumping press.

The various gins, if in full operation, are able to deal with about 7 tons of raw cotton daily. The earnest wish of the proprietors is that at an early date an increasing production will demand further additions, which the firm are prepared to undertake when necessary. The confidence shown by Kitchen and Sons in the cotton industry should convince growers of an assured market for all the fibre they can produce. This season's yield per acre is giving satisfaction, judging by the reports to hand. Growers are obtaining a gross return per acre from £6 to £10 for Upland cotton, which may be regarded as very satisfactory.

STRIPPING SUGAR-CANES.

Experiments were made in Hawaii in 1904 and 1905 on the effects of stripping trash from sugar-canes. There were three strippings. The following were the principal results:—

1. The average weight per acre of unstripped canes was 24·31 tons more than that of stripped canes, and the yield of sugar was 4·38 tons per acre greater.

2. The unstripped canes showed a gain in weight from the application of a fertiliser, and the stripped canes a loss.

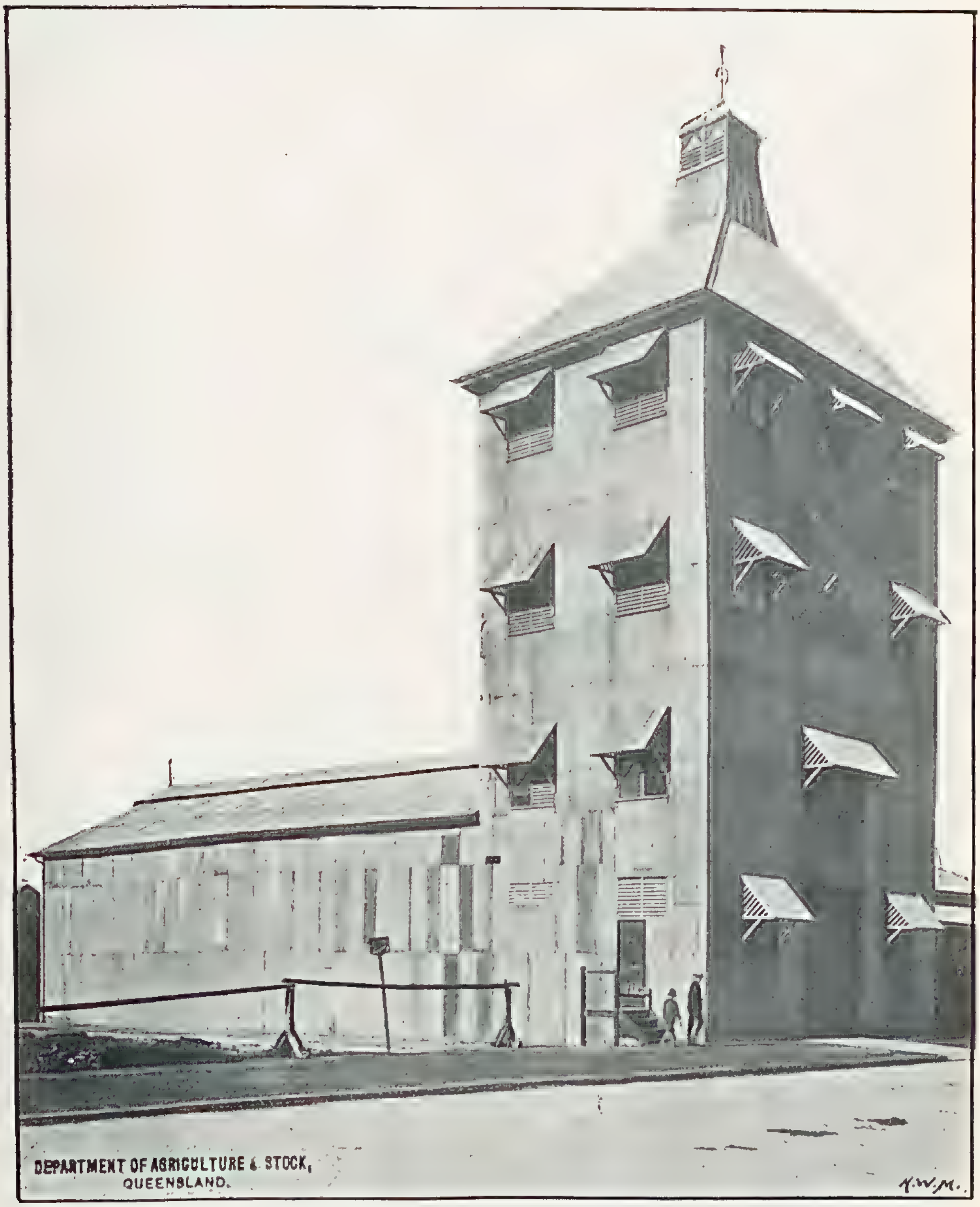
3. There were, on the average, 2,539 more dead canes to the acre among the stripped canes than among the unstripped ones.

It appears that the stripped canes were more liable to disease, and the results in (1) and (2) are perhaps the consequence of this.—"Agricultural News," Barbados.

HANDLING BEES SAFELY.

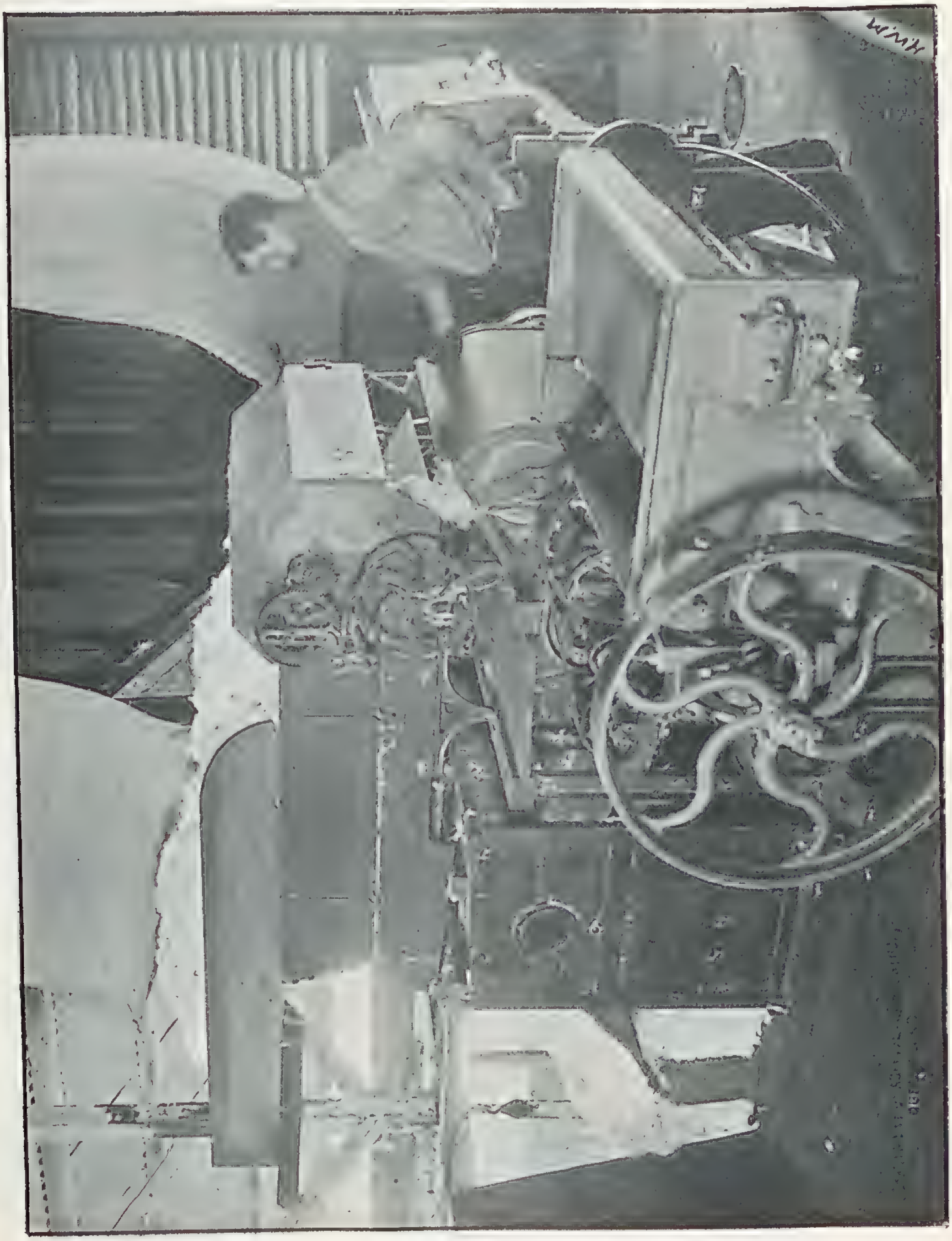
It is not generally known that anyone attending to bees may escape many stings by first thoroughly washing their hands, and then rubbing them all over with a little pure beeswax. This prevents any odour from the hands being noticed by the bees. The scent from the beeswax attracts a bee's attention very strongly, and seems to deprive it of any hostility or bad temper.—Natal "Agricultural Journal."

Plate III.



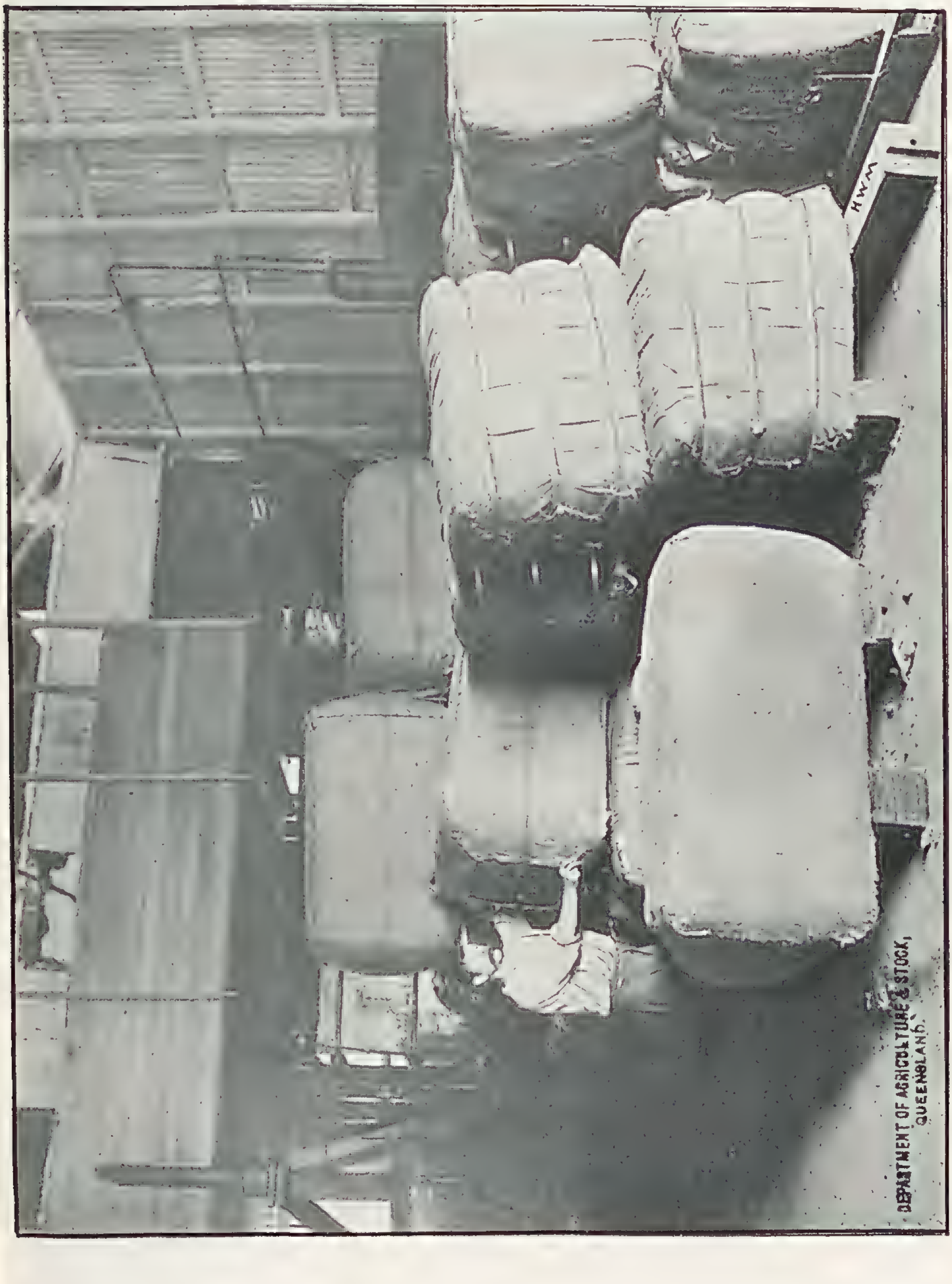
Messrs. Kitchen and Sons' Cotton Ginnery, Fortitude Valley, Brisbane.

Plate IV.



SAW GINS AT WORK IN THE GIN ROOM.

Plate V.



BALING COTTON IN THE PRESS ROOM.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

Eighteenth Lesson.

Farm Crops.—Classification of Crops. How Crops Grow. Dominant Manures. Maintenance of Fertility. Migration of Plant Foods. Rotation of Crops. Requirements of a few Important Crops with regard to Soil and Fertilisers.

Our previous lessons, which dealt with general elementary principles of agricultural chemistry, will serve as a key to the more practical application treated in this and future lessons.

We will now consider **farm crops,** in their widest sense, as the products of vegetable growth, utilised in one manner or the other by the agriculturist, and learn something about the requirements of a few of the most important crops with regard to the soil they prefer and the manures they require. Farm crops may be classified as follows:—

1. **Grain crops,** with subdivisions: (*a*) Of *cereals,* as wheat, corn, barley, oats, rice, &c.; (*b*) of *leguminous plants,* as beans, peas, &c.
2. **Root crops,** as turnips, mangolds, potatoes, sweet potatoes, arrowroot, cassava, &c.
3. **Fodder crops,** as grasses, sorghum, lucerne, and leguminous crops used as fodder and as green manure.
4. **Fruit crops,** as product of orchards, vineyards, also pineapples, strawberries, raspberries, &c.
5. **Market** and **garden crops,** as cabbages, onions, carrots, tomatoes, cucumbers, lettuce, asparagus, &c.
6. **Fibre crops,** as cotton, flax, sisal hemp, jute, broom corn, &c.
7. **Oil crops,** as castor oil seeds, peanuts, linseed, sesame, olives, rape, hemp, cocoanuts, &c.
8. **Miscellaneous crops,** as tobacco, coffee, ginger, vanilla, medicinal plants, perfumery plants, &c.;

and, finally, we must add the products of the science of forestry, so closely allied to agriculture—

9. **Forestry crops,** as timber, tanning barks, essential oils, rosins, rubber, &c.

"**How Crops Grow.**"—We have already learned a good deal in previous lessons on the growth of plants, and should know that it depends on a large number of factors, as the condition and fertility of the soil, moisture in the ground, heat, light, air, and, perhaps, to some degree on electric conditions. In this lesson I can only deal in a very superficial manner with some of these factors, and I must refer the student desirous of fuller information to the admirable works of Professor Sam. W. Johnson, "*How Crops Grow*" and "*How Crops Feed.*"

Farmers, from practical experiences, soon learned that growing the same crop on the same piece of land gave from year to year poorer results, and that even careful tillage, draining, and similar work, which are absolutely necessary to successful farming, are not sufficient to maintain the fertility of the soil. Experiments have also taught the farmers that certain classes of soil are more suitable to certain crops than others, and that, for instance, a certain class of

soil, which grows only a very poor crop of wheat, may give a splendid crop of oats. Again, it was found that by growing various crops in rotation the fertility of the soil, as judged by the yield of the individual crops, was maintained much longer. Science had to come to the rescue and explain the why and wherefore of such results.

A large number of experiments, carefully carried out by agricultural scientists in all parts of the world, clearly demonstrated that certain crops require a predominant amount of one or the other of the fertilising elements of plant food which for the particular crop is called the "dominant manure." It was found that certain crops require relatively larger amounts of nitrogen; others, again, larger amounts of potash, which must be found available in the soil. We have learned already that, although the largest amount of material forming the composition of plants are taken from the surrounding atmospheric air, still small amounts of mineral constituents are absolutely necessary to plant life, and these minute quantities of mineral matters have to be obtained from the soil. The old idea that the fine tips of rootlets excrete a strong organic acid, to dissolve soil particles to get these mineral constituents, has pretty well been abandoned, and that the solvent action of the roots is attributed to small amounts of carbonic acid given off by the roots. We know that water, containing small amounts of carbonic acid gas in solution, has a far greater solvent power for certain mineral salts than pure water, and to this fact the solvent action of roots on the soil particles, with which they are in contact, is largely due.

Analyses of whole plants, and of their various parts, as stem, leaves, fruits, and seeds, have shown that they contain very varying amounts of mineral matters, and that also the mineral matters left in the form of an ash, when the plants are burned, differ in their composition. Some of the plant ashes are very rich in potash; others, again, contain relatively high amounts of phosphoric acid; and in others, again, lime is the predominant constituent. An enormous number of plant ash analyses have been carried out in all agricultural laboratories, and are collected in Professor Dr. Emil Wolff's book on "Ash Analyses." From the result of such analyses it was noticed that, as a rule, the principal ingredient of the plant ash indicates the dominant mineral manure necessary for the plant from which the ash was obtained. At the same time, it was found that all the other fertilising ingredients had to be available to the plant in sufficient quantities to obtain heavy crops. Another very interesting discovery in connection with the assimilation of plant foods was made only of late years by Professor Wilfarth, in extension of the observation on the **migration of plant foods** made by other investigators, which shows that the amounts of plant foods varied at different periods of growth, and that the maximum quantities reached at certain periods did not remain permanently in the plants, *but certain amounts of these substances were returned to the soil as the plants reached maturity.* Certain crops, like wheat, barley, mustard, and peas, contain their maximum amount of assimilated plant foods at the time of full bloom; whereas potatoes did not reach this maximum until the crop was fully matured and ready for harvest. During the growth of a crop of potatoes no plant foods are returned to the soil, whereas during the ripening periods of other crops considerable amounts of potash and nitrogen and small amounts of phosphoric acid were returned to the soil. It was found, for instance, that a crop of barley, when eleven weeks only, contained in the whole plant, including green and yellow leaves, stem, stubble, roots, ears, awns, and grains per acre: 77·1 lb. nitrogen, 127·6 lb. potash, 56·1 lb. soda, and 39·0 lb. phosphoric acid; and at the age of full maturity, seventeen weeks old: 57·6 lb. nitrogen, 82·9 lb. potash, 34·5 lb. soda, and 36·3 lb. P_2O_1—so that from these substances 25·5 per cent., 35·0 per cent., 38·5 per cent., and 6·7 per cent. were returned to the soil.

With potatoes the result was quite different, as in this plant, with the enormous increase of the starch contents, a steady increase of other plant foods

went hand-in-hand, as seen from the following table, giving again the amounts in lb. per acre:—

	Starch.	Nitrogen.	Potash.	Soda.	Phos. Acid.
7 weeks after planting ...	80	45	47	4	8
11 " " ...	1,565	74	79	9	15
16 " " ...	3,622	105	113	10	26
23 " " ...	5,325	111	149	·18	28

These results further show that in the case of potatoes the amount of potash in the total crop is very high, and, as none is returned to the soil, they confirm the fact that potash is the dominant manure for potatoes. In the case of wheat and barley, the ash analyses of the plant at time of harvest would not indicate the true requirement of the crop, but considerably larger amounts of the plant foods have to be found available in the soil to obtain a full yield. This law of migration of plant foods has an important bearing on the maintenance of the fertility of a soil, as it shows clearly that a crop of potatoes is much more exhausting to the soil than a cereal crop of wheat or barley.

Any land, after growing the same crop for a few years, becomes "tired," actually worn out; the crops become poorer, and are more liable to diseases. As a consequence of this, in large tracts of country one race of plants is gradually replaced by another. In many places of Europe fine oak forests have been gradually changed into pine forests, and the pine-trees again have given way to beeches. Every plant favours a particular class of soil. Wheat thrives best in a clayey soil; potatoes prefer a sandy loam, and if grown in a clay soil produce a very waxy potato. The natural flora of any district is, for this reason, generally a very fair indication of the quality of the soil, as the plants, to which the soil is more particularly suited, will crowd out others which are growing under less favourable conditions.

In the artificial **rotation of crops** which has been generally adopted by farmers in all parts of the world, but which is hardly as extensively practised in Australia as it deserves to be, the agriculturist follows a law of Nature. Many systems of rotation from a two-years' to an eight-years' course are practised, and they all depend largely on climate, soil, and the markets of the district; but the main objects of any system are the same, and are the following:—

Manures are economised, as the different crops require various amounts of food, and the one which is not utilised by one crop will be made use of by the following crop. The labour required for the working and harvesting of the various crops is more evenly distributed over the whole year.

Deep-rooted crops draw plant foods from a greater depth of soil, and thus help after their decay the following shallow-rooted crops, and one crop can be a preparation and aid to the crop following.

The land is easier kept clean and in a healthy condition, checking the effects of fungi and insect pests, and thus producing crops of greater vigour.

A greater variety of crops are produced for the requirement of live stock and of local markets.

There is a better chance of getting a fair return from one crop under adverse climatic conditions when other crops are complete or partial failures.

One of the most typical rotation of crops is the old **Norfolk four-course system**, in which we have a first-year crop of wheat, followed by a root crop in the second year, barley or oats in the third year, and a leguminous crop like clover, peas, or beans in the fourth year.

The composition of a soil does not only influence the yield and quality of a crop, grown on such soil, but also the growth of animals feeding on such crops, and the products obtained from such animals. It is a well-known fact that cheese, manufactured in a district having soils deficient in lime, is of very poor quality, and I have little doubt that the keeping quality of butter, and also its aroma, is largely depending on the quality of the soil on which the dairy herds are grazing

Already in their earliest stages of growth the various plants start in their struggle for life with various handicaps. We know that every seed must be considered as a store of concentrated plant foods, required for the nourishment of the young seedling, until it is able to draw its nutriment from the surrounding soil and atmosphere. Some crops with exceedingly small seeds, like tobacco, for instance, are very much more difficult to raise than other plants with larger seeds, like peas or beans, which give the young seedling a fair start before it requires food from its surroundings.

At the same time, some seedling plants, which had a good start due to the large size of the seed, may not withstand hardships in the later periods of their growth as well as the well-established seedling which originally had a very slow start.

As the plants get older it may be noticed that their power to assimilate plant foods varies very much for the different crops; some crops not only draw from the soil, but the roots even penetrate to the subsoil in search of food; whereas others again only draw from a shallow depth of top soil, and consequently require a much richer soil.

We will now consider briefly the requirements of a few of the more important crops, and more particularly study the amount of mineral matters removed from the soil, the classes of soil most suitable to certain crops, and also the kind of manure most beneficial. Of course it must be clearly understood that local conditions will frequently necessitate modification of general manuring formulas, but the farmers have it always in their hands to find out, by the aid of practical fertilising experiments carried out on a very small scale on their fields, the actual requirements of any crop and the fertiliser most suitable for their soils and climatic conditions. In many cases the amounts of plant food taken from the soil are taken from the results of investigations carried out at our Agricultural Laboratory, and such figures are in all cases marked (Q.); other data are taken from the "Agricultural Note-book," by Primrose McConnell (Crosby, Lockwood, and Son, London, 1904), a useful little publication, which ought to be in the hands of every agriculturist; and also from the admirable work, "Agricultural Botany," by J. Percival (Duckworth and Co., London, 1900).

The other side of the question—the composition of crops in regard to their value as foods—will be dealt with in our next lesson.

1. *Grain crops (a) cereals:*

Wheat.—Many varieties of soil are suitable to the different varieties of wheats grown, but as a rule a clayey loam, with a light porous subsoil and a warm, rather dry, climate, is best suited to cultivation of wheat. Very stiff wet clay soils are not adapted for wheat. Like most of the cereals, wheat has only a moderate demand for lime, potash, nitrogen, and phosphoric acid. Still, light dressings with *complete manures*, containing *nitrogen* in the form of nitrate, *phosphoric acid* in the form of superphosphate, and *potash* in the form of potassium sulphate, are used with great benefits to obtain heavy yields of grain, and even very small dressings of such fertilisers have given excellent results. A top-dressing of the well-established crop with nitrate of soda is often very beneficial. At one of our State farms (Biggenden) an average crop of wheat of 30 bushels per acre, and of various varieties, removed from the ground in the grain alone per acre—

47·9 lb. nitrogen, 6·8 lb. of potash, and 10·6 lb. phosphoric acid (Q.);
and at another farm an average crop of 20 bushels removed—

25·4 lb. nitrogen, 7·1 lb. potash, and 12·3 lb. phosphoric acid (Q.).

A *complete fertiliser* for wheat should contain per acre from $\frac{1}{2}$ to $1\frac{1}{2}$ cwt. of superphosphate, $\frac{1}{2}$ to 1 cwt. of potassium sulphate, and $\frac{1}{2}$ to $1\frac{1}{2}$ cwt. of sodium nitrate, of which two-thirds can be applied as a top-dressing, the rest with the other manures at time of drilling.

Oats.—This crop may be grown successfully on almost any class of soil, but requires a rather cooler and moister climate than wheat. Good results have been obtained with complete fertilisers similarly to the one given for wheat. A crop of 45 bushels per acre removes in the grain 38 lb. nitrogen, 9 lb. potash, and 13 lb. phosphoric acid.

Barley requires a light loamy soil; heavy wet clays are quite unsuitable. Barley also requires a complete manure, but nitrogenous manures must be applied in moderation, as too much nitrogen would increase the albuminoids in the grain too much, and make them unsuitable for malting. A crop of Chevalier barley removed, according to Professor Wilfarth, in lb. per acre: In the grain—

39·4 lb. nitrogen, 20·5 lb. potash, 26·6 lb. phosphoric acid;

in the total plant—

57·7 lb. nitrogen, 82·9 lb. potash, 36·4 lb. phosphoric acid.

Maize will grow on almost any kind of soil, but does best on a deep, fairly heavy loam. This crop makes a much heavier demand on plant foods than other cereals, and gives the best results with barnyard manure or mineral fertiliser in connection with farmyard manure. A maize crop (several varieties) contained per acre: In grains, at 30 bushels—

34·4 lb. N, 7·2 lb. K_2O, 15·5 lb. P_2O_5 (Q.);

at 50 bushels—

57·3 lb. N, 12·0 lb. K_2O, 25·8 lb. P_2O_5 (Q.);

and in the whole plant—

220 lb. N, 40 lb. K_2O, 21 lb. P_2O_5 (Q.)

(26 tons green crop per acre).

Rice requires a rich strong soil, rich in potash. Light soils require very heavy manuring. The mountain rice varieties prefer a lighter sandy soil.

(*b*) *Leguminous Grain Crops.*—These seeds contain a much larger proportion of nitrogen than the seeds of cereals, and also large amounts of potash and lime. The nitrogen is largely obtained by direct assimilation of atmospheric nitrogen by the aid of bacteria in the root nodules.

Field peas require a medium quality sandy loam, which must contain sufficient lime. A crop of field peas removed from the soil—

163·5 lb. N, 128·3 lb. K_2O, and 16·6 lb. P_2O_5 per acre (Q.).

Beans require a well-drained clayey loam, fairly rich in humus.

2. *Root Crops.*—All root crops contain a large amount of nitrogen, largely in the form of amides, and also a high percentage of mineral matters. The tubers contain a very large amount of water, sometimes 90 per cent. and over of their weight.

Turnips, swedes, mangel-wurzel (mangolds), are very exhausting crops, and should, therefore, not be planted too often in succession. They all require deep strong loams, but do not like too heavy clays. These crops remove from the soils per acre —

Turnips (17-ton crop) ...	63 lb. N	109 lb. K_2O	22 lb. P_2O_5
Swedes (14-ton crop) ...	70 lb. N	63 lb. K_2O	17 lb. P_2O_5
Mangolds (22-ton crop)	87 lb. N	223 lb. K_2O	34 lb. P_2O_5

Mangolds require a warm and rather dry climate, and they often derive great benefit from a dressing with common salt. A complete manure is made up with 2 cwt. nitrate of soda, 3 cwt. superphosphate or Thomas slag, and 5 cwt. of kainit per acre.

Turnips are not quite so exhausting, but the complete manure requires rather more phosphoric acid, up to 5 cwt., and a little less nitrogen.

All these roots contain often from 5 to 8 per cent. of sugar.

Potatoes.—Although this crop is a surface-feeder, it requires a deep sandy loam, with a well-drained, porous subsoil. A warm and rather dry climate, and

absence of frosts, is necessary to successful culture. Potatoes accumulate in their tubers very large amounts of starch, as clearly shown from the figures already given, and for this assmilation considerable amounts of potash are necessary, so that potash is the dominant manure for potatoes. Farmyard manure and green manure crops are of great advantage. A complete artificial manure is made up from 1 to 2 cwt. of nitrate of soda, 2 to 3 cwt. of superphosphate or Thomas phosphate, 3 to 4 cwt of kainit, or 1 to 2 cwt. of potassium sulphate.

According to P. F. Ashby, recent experiments have clearly shown that the physical condition of the soil has a great influence on the quality of the potatoes, and that the best potatoes are obtained from a soil neither lacking gravel and coarse sand, which give the soil porosity, nor the finest particles of silt and clay, which help in the retention of moisture. Of course, climate will modify the value of the soil with regard to quality and yield of potatoes, so that a heavier soil will be better suited for the growth of potatoes in a warm, dry climate.

Sweet potatoes require soil similar to potatoes, and also a complete manure rich in potash salts.

Similar remarks apply to **cassava, arrowroot,** and other crops grown on account of their starchy tubers, which, however, do not require such a heavy manuring as potatoes.

3. *Fodder crops* are grown chiefly on account of their succulent foliage and stems, the seeds being of lesser importance. The principal fodder plants belong to the orders of *gramineæ* (grasses), *leguminosæ*, and a few others.

Ordinary **pasture** consists generally of a great variety of plants, in which, however, grasses are predominant. The roots of grasses are almost entirely confined to the surface soil, and grass land, in order to keep up its fertility and to yield heavy crops of nutritious fodder, requires manuring with a complete fertiliser, containing from 1½ to 3 cwt. of basic slag, 2 to 3 cwt. of kainit, and 1 to 2 cwt. of dried blood. Manuring with dried blood, meatworks manure, bonemeal, is also of benefit. An average crop of various varieties of grasses, giving 3·9 tons of hay, took from the soil per acre—

97 lb. N, 30 lb. CaO, 117 lb. K_2O, and 23·5 lb. P_2O_5 (Q.);

whereas a heavy crop, yielding 6·5 tons of hay, required—

254 lb. N, 69 lb. CaO, 546 lb. K_2O, and 71 lb. P_2O_5 (Q.).

Both **maize, sorghum,** and similar plants are frequently grown as fodder crops, to be fed either in a green state or to be made into ensilage. We have already seen the requirements of a green crop of maize, and I must state here that sorghum takes even more out of a soil than maize. An average of eight varieties of sorghum, yielding 60 tons of green material per acre, contained therein—

630 lb. N, 204 lb. K_2O, and 52 lb. P_2O_5 (Q.);

and this crop requires a liberal manuring with 1 to 2 cwt. of superphosphate, 1 to 2 cwt. of kainit, and 1 to 1½ cwt. of nitrate of soda or sulphate of ammonia. Deep loamy soil, not wanting in lime, and in a rather dry situation, gives the best results with sorghum.

Of the leguminous fodder crops, for our climatic conditions in Southern Queensland, **lucerne** is the most important one, being one of our most valuable fodder plants, doing well on rich loams or clayey soil containing plenty of lime. The crop requires a good and fairly open subsoil, as the roots go down to a great depth. Lucerne suffers little from drought when it is once properly established, and yields three, and more, heavy cuts of fodder every season for several years. A crop of lucerne weighing 4 tons as hay contained—

226 lb. N, 229 lb. K_2O, and 33 lb. P_2O_5 (Q.);

potash being the dominant ingredient of a fertiliser for lucerne, which on poorer soils requires an occasional top-dressing with 1 to 2 cwt. of basic slag and ½ to 2 cwt. of kainit or other potash manure.

Another valuable leguminous crop are the **cow peas,** which are generally grown as a green manure crop, but also make a very nutritious hay and chaff. Potash is again the dominant manure, as shown from the average of analyses of various crops grown under different conditions, which yielded 21·6 tons green material per acre, containing—

357 lb. N, 317 lb. K_2O, and 55 lb. P_2O_5 (Q.);

whereas the average of twenty different leguminous green manure crops gave a yield of 13 tons per acre, containing—

208 lb. N, 200 lb. K_2O, and 38 lb. P_2O_5 (Q.);

and a large crop of grey cow peas gave 27 tons of green material, equal to 8·2 tons of dry substance per acre, containing

446 lb. N, 388 lb. K_2O, and 125 lb. P_2O_5 (Q.).

4. *Fruit Crops.*—For the growing of **citrus fruits, as oranges** and **lemons,** a deep, loose, and well-drained soil, rich in lime, is necessary, and, in order to keep up the fertility of the orchard to get good crops of prime fruit and to maintain the trees in perfect health, thorough cultivation and judicious manuring are absolutely necessary. A crop of 20,000 fruits removes from the soil per acre—

Oranges	37 lb. N	42 lb. K_2O	11 lb. P_2O_5
Lemons	30 lb. N	54 lb. K_2O	12 lb. P_2O_5

For the manuring of orange-trees in full bearing, our Instructor in Fruit Culture, Mr. A. H. Benson, recommends to apply per acre a fertiliser containing 80 lb. of nitrogen in the form of blood or ammonium sulphate, 80 lb. of potash as potassium sulphate, and 40 lb. of P_2O_5 in the form as superphosphate or Thomas phosphate. Humus and also nitrogen may be supplied to the trees by growing leguminous and other green manure crops.

Pineapples.—Pineapple plants are very heavy feeders, and remove a large amount of plant food from the soil. As an average of a large number of estimations, a good crop of fruit removed per acre annually—

40 lb. N, 67 lb. K_2O, and 17 lb. P_2O_5 (Q.);

whereas the whole crop of plants contains, per acre—

722 lb. N, 747 lb. K_2O, and 290 lb. P_2O_5 (Q.)

Deep cultivation seems of the greatest importance to keep the pines in good health and to induce them to develop a good healthy root system. As a basis for our manuring experiments, we use a complete fertiliser containing—

150 lb. K_2O, applied as potassium sulphate;
75 lb. N, applied as dried blood or ammonium sulphate;
75 lb. P_2O_5, applied as superphosphate.

5. *Market and garden crops* include all **vegetables,** which all require a good loamy soil, rich in humus, and a liberal supply of quick-acting fertilisers to obtain paying crops. I will give a short table, which shows what average crops of various vegetables take from the soil, which will help in making up fertiliser formulas for each of the crops:—

	Lb. per Acre.			
	Nitrogen. N.	Lime. CaO.	Potash. K_2O.	Phosphoric Acid. P_2O_5.
Cabbage	170 to 200	100 to 150	55 to 120	58 to 70
Cauliflower	150	50	45	50
Carrots	70	45	75	25
Onions	81	48	75	36
Tomatoes	48	20	81	16
Cucumber	50	12	72	36
Lettuce	50	13	90	18
Turnips	112	74	150	33
Spinach	147	57	75	48
Celery	48	46	152	44
Peas	96	30	19	90
Beans	210	50	220	230

6. *Fibre Crops.*—One of our principal fibre crops, which is gaining steadily in importance, is **cotton.** This crop prefers a sandy loam, and heavier soils if they contain plenty of lime. Cotton is most profitably grown in rotation with other crops, and requires in that case only a comparatively light dressing with artificial manures, containing per acre about 20 lb. N, 15 lb. K_2O, and 50 lb. P_2O_5, applied in the form of the following mixtures:—

(1) Dried blood, 1 to 1½ cwt.; bonemeal, 2 cwt.; potassium sulphate, ½ cwt.

(2) Thomas phosphate, 2 cwt.; ammonium sulphate, ½ cwt.; potassium sulphate, ½ cwt.

(3) Meatworks manure (with blood), 3 to 4 cwt.; potassium sulphate, ½ cwt.

If the land shows that the crops become susceptible to blight, the following mixture should be used in preference:—

(4) Kainit, 1 to 1½ cwt.; Thomas sulphate, 2 cwt.; dried blood, 1 to 1½ cwt.

Sisal hemp is another important fibre plant, already extensively cultivated in our State. It thrives best on a sandy, gravelly loam containing sufficient amount of lime; if the soil is too rich and heavy, the growth is too rank, and the plant gives a coarse fibre of inferior quality. The crop removes a considerable amount of mineral food, chiefly potash and phosphoric acid, from the ground, and as the cultivation, yielding profitable crops, extends up to eight and more years, an application of artificial fertilisers is necessary from time to time, supplying per acre 20 lb. N, 70 lb. K_2O, and 40 lb. P_2O_5.

Oil Crops.—Crops grown for the production of oily seeds, like **castor oil plant, olive-trees, cocoanut and oil palms,** are rarely manured with artificial fertilisers, but should, whenever possible, get a dressing with compost, in which the waste product of the oil manufacture should make the principal ingredient. Good cultivation and an occasional crop of green manure ploughed in will improve crops.

8. *Miscellaneous Crops.*—**Tobacco** requires a light sandy loam, containing a sufficient amount of humus. Tobacco is rather an exhausting crop, and must get a liberal supply of fertilisers, in the selection of which it must be kept in mind that manures containing chlorides like kainit and potassium chloride, must be avoided, as such manures have an influence on the texture, aroma, and burning qualities of the tobacco. The artificial fertilisers best suited are:—Potassium sulphate, in quantities from 1 to 3 cwt. per acre; nitrogen, in the form of dried blood or nitrate of soda, 1 to 3 cwt., or of cotton-seed meal, 2 to 6 cwt.; and, finally, phosphoric acid, in the form of 1 to 2 cwt. of superphosphate or Thomas phosphate. A good average crop of tobacco removes from the soil—

76 lb. N, 200 lb. K_2O, and 16 lb. P_2O_5 per acre.

9. Very little attention has been hitherto paid in this State to *scientific forestry*, and there can be no doubt that his branch of agriculture has a very great future, not only with regard to the growing of marketable timbers, but also for the production of tanning barks, rubber, eucalyptus oils, &c.

Many of the ashes of our native timbers are characterised by the very large amounts of lime they contain. We found, for instance, that the ashes of "belar," "gidya," and "brigalow" contained from 83 to 91 per cent. of CaO.

In order to be able to prepare any manure mixture from different fertilisers obtainable locally, I give herewith a table showing the average amounts of fertilising ingredients in each manure.

	Percentage of— Nitrogen. N.	Potash. K_2O.	Phosphoric Acid. P_2O_5.
Dried blood ...	12 to 14	...	1·4 to 1·9 insoluble
Meatworks manure with blood ...	6	...	11 to 14 insoluble
„ „ without blood ...	5 to 5·5	...	14 to 15 insoluble
Bone meal ...	3·5 to 4	...	22 to 27 insoluble
Pea-nut oil cake ...	7·8	2	0·6 insoluble
Bats' guano ...	0·5	0·2	3·0 insoluble
Sulphate of ammonia ...	20 to 21		
Nitrate of soda or chili saltpetre ...	15 to 16		
Saltpetre or potass. nitrate ...	17	40	
Potassium sulphate ...	...	52 to 53	
Kainite ...	...	12·5	
Superphosphate, A1 ...	...	...	18·8 water soluble
Thomas phosphate, or basic slag ...	...	...	17·5 to 18 citrate soluble
Cereal guano ...	3·4	2·5	9·8 water soluble; 2·7 insoluble
Ohlendorff's early cane manure ...	4·0	8·3	5·5 water soluble; 1·7 citrate soluble
„ special „ ...	7·4	3·8	8·2 water soluble; 1·8 citrate soluble
Millaquin X fertiliser ...	...	3·3	4·2 water soluble; 11·6 insoluble
„ MK „ ...	4·8	3·3	4·2 insoluble.

Soil, in order to profit by the application of artificial fertilisers, must be in first-class physical condition, and particularly deep cultivation, with subsoiling, cannot be too strongly recommended. Very often fertilisers fail to show any improvements in the crops, due to bad conditions of soil, want of draining, and unfavourable climatic conditions; and, again, if lime should be wanting in the soil, which in our State, more particularly in the coastal lands, is frequently the case. Wherever farmyard manure is available, it should be used in conjunction with artificial fertilisers, which thereby give better results, even if only very small amounts of such composts had been added. These improvements are due to a greater bacterial activity in the soil, encouraged by the organic matters contained in the farmyard manure.

Finally, I will append here a useful **table for the conversion** of some of the fertilising compounds into the simple ones of N, K_2O, and P_2O_5, required for the calculation of fertiliser formulas:—

Amount of—	Multiplied by—	Gives the Corresponding Amount of—
Ammonia, NH_3 ...	0·824	Nitrogen, N
Ammonium sulphate, $(NH_4)_2SO_4$ ...	0·212	Nitrogen, N
Sodium nitrate, $NaNO_3$ ...	0·165	Nitrogen, N
Potassium nitrate, KNO_3 ...	0·1835	Nitrogen, N
Nitrogen, N ...	1·214	Ammonia, NH_3
Potassium sulphate, K_2SO_4 ...	0·541	Potash, K_2O
Potassium chloride, KCl ...	0·631	Potash, K_2O
Potassium nitrate, KNO_3 ...	0·466	Potash, K_2O
Tricalcic phosphate, $Ca_3P_2O_8$ ...	0·458	Citrate insoluble ... Phosphoric acid, P_2O_5
Monocalcic phosphate, $CaH_4P_2O_8$ ...	0·607	Water soluble ... Phosphoric acid, P_2O_5
Tetracalcic phosphate, $Ca_4P_2O_9$ ...	0·391	Citrate soluble ... Phosphoric acid, P_2O_5
Limestone, $CaCO_3$ ...	0·560	Lime, CaO
Gypsum, $CaSO_4$ ...	0·411	Lime, CaO

QUESTIONS TO EIGHTEENTH LESSON.

1. How may farm crops be classified?
2. In what manner can the fertility of a soil be maintained?
3. What happens when crops are grown on the same soil for years?
4. What is a dominant manure?
5. What are the dominant manures for cereals and for root crops?
6. How do the plant roots avail themselves of the mineral food in the soil?
7. What is the principle of migration of plant food in crops?
8. Do ash analyses of final crops always indicate the requirement of the crop for certain plant foods?
9. What is the object of rotation of crops?
10. What is the Norfolk system?
11. What are the objects of green manuring?
12. Why is the addition of farmyard manure to artificial fertilisers so beneficial to the crops?

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.								1907.				
	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.
North.													
Bowen	6·34	0·69	0·04	0·36	3·41	1·76	0·99	11·01	2·53	3·74	1·97	0·39	3·46
Cairns	4·04	3·44	2·28	1·79	1·57	0·56	13·26	11·31	18·36	11·49	3·26	3·35	8·65
Geraldton	7·93	16·05	5·73	6·65	4·26	2·28	21·08	21·20	29·58	25·26	4·58	6·08	21·91
Herberton	1·38	1·04	0·59	0·55	0·38	0·30	5·16	10·82	10·56	11·77	2·05	0·90	1·57
Hughenden	Nil	Nil	Nil	Nil	0·92	0·61	0·51	4·76	1·98	3·83	1·17	0·16	1·34
Kamerunga State Nurs.	4·13	3·55	2·49	2·03	2·56	0·72	10·00	8·17	15·78	14·82	4·87	2·80	9·33
Longreach	0·22	Nil	0·11	Nil	4·11	2·16	0·66	0·51	1·22	0·49	1·88	0·85	0·93
Lucinda	3·77	3·02	0·40	...	Nil	1·85	6·60	*22·36	12·38	23·82	4·53	*3·82	19·29
Mackay	11·87	3·85	0·68	0·93	4·35	2·63	1·80	12·93	2·72	6·42	8·01	1·58	*6·09
Rockhampton	5·27	1·12	Nil	2·61	3·80	1·07	0·46	5·19	4·15	4·12	3·05	0·44	0·94
Townsville	1·80	0·30	Nil	0·46	3·25	1·45	7·74	14·03	12·49	7·75	7·37	1·03	3·11
South.													
Barcaldine	1·70	0·19	0·10	Nil	2·88	2·92	1·33	1·04	3·44	0·43	1·51	0·82	0·34
Beenleigh	3·57	1·17	0·16	2·94	3·47	2·94	1·75	3·98	4·75	3·88	4·17	0·58	4·70
Biggenden State Farm	5·77	1·42	0·48	3·02	5·07	1·19	3·09	4·55	5·77	3·55	*12·91	0·34	*3·95
Blackall	1·75	0·22	0·48	0·02	4·70	5·86	1·37	1·96	2·30	Nil	2·78	1·69	*0·20
Brisbane	3·23	1·38	0·22	4·21	3·48	3·81	1·07	3·28	2·69	5·23	5·32	0·45	4·75
Bundaberg	8·44	2·01	0·03	1·86	10·90	1·57	0·97	3·85	3·29	3·90	12·81	0·38	3·08
Caboolture	4·53	0·85	0·29	3·02	4·77	4·73	4·26	3·15	2·53	8·03	*9·04	0·78	3·10
Charleville	0.85	0·13	2·34	0·35	4·99	2·66	1·30	3·71	0·85	Nil	2·75	2·29	0·26
Dalby	0·68	0·87	1·58	2·78	2·65	2·96	2·12	5·67	5·60	1·34	3·72	0·20	2·26
Emerald	2·12	0·17	Nil	1·62	4·47	1·55	2·32	1·79	7·36	3·67	7·66	Nil	Nil
Esk	3·25	0·77	0·38	4·51	4·14	2·90	2·45	5·26	2·87	6·79	3·60	0·22	5·42
Gatton Agric. College	1·90	0·60	0·41	3·73	3·54	2·25	2·01	3·45	2·62	6·44	2·71	Nil	2·80
Gayndah	5·10	0·48	0·22	2·34	5·14	2·25	4·25	2·82	3·00	1·91	6·89	Nil	2·65
Gindie State Farm ...	2·32	0·05	Nil	1·46	4·57	3·20	2·95	1·45	6·13	0·71	10·10	Nil	Nil
Goondiwindi	2·80	0·98	0·49	4·35	3·33	2·36	2·32	4·01	5·37	1·77	6·51	0·33	1·30
Gympie	6·88	2·26	0·52	3·19	3·97	3·03	4·12	5·32	3·99	6·96	8·93	1·12	3·84
Ipswich	1·67	0·25	0·17	2·59	2·94	2·60	0·71	4·22	2·17	5·38	1·95	0·12	3·13
Laidley	2·83	0·49	0·50	3·26	3·19	2·87	1·78	4·12	2·84	4·50	3·47	Nil	2·99
Maryborough	4·85	2·55	0·15	2·31	6·48	1·22	2·49	4·39	5·52	7·84	10·28	1·25	3·21
Nambour	6·20	3·68	0·61	4·52	8·94	4·89	3·40	6·74	5·74	12·05	13·30	1·36	4·54
Nerang	10·32	1·98	0·12	3·56	6·42	8·26	2·75	6·33	9·86	6·04	7·83	1·48	7·54
Roma	1·09	1·08	1·65	1·47	4·43	2·37	1·32	4·31	6·32	2·92	1·87	0·42	0·27
Stanthorpe	0·77	0·45	1·44	3·37	4·29	2·90	2·49	4·89	4·33	3·30	5·98	1·68	1·79
Tambo	0·66	0·05	0·67	0·07	5·17	2·85	1·23	1·16	4·74	1·41	3·58	3·69	0·11
Taroom	1·04	0·81	0·60	2·30	4·26	1·70	1·35	5·49	5·16	1·10	1·86	Nil	1·01
Tewantin	4·61	5·68	0·39	4·25	6·37	4·38	2·73	9·53	6·38	15·83	11·45	1·87	7·16
Texas	1·57	0·75	0·90	3·22	2·77	3·42	2·23	1·83	4·69	4·55	6·16	0·65	0·93
Toowoomba	2·65	0·85	1·81	3·63	4·55	2·76	2·65	4·11	3·94	4·00	4·81	0·01	4·61
Warwick	0·77	0·57	1·16	3·85	3·13	2·47	2·99	5·50	3·95	2·52	5·71	0·51	1·58
Westbrook	0·50	0·55	1·67	2·80	3·34	3·41	1·79	1·48	1·79	2·91	5·13	0·02	2·53

* Compiled from telegraphic reports.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

LETTER FROM AN EX-STUDENT OF THE QUEENSLAND AGRICULTURAL COLLEGE.

Mr. J. Mahon, Principal of the Queensland Agricultural College, does not forget to keep in touch with the past students. He has just received and forwarded to us the following interesting letter from Mr. A. P. Fountain, an ex-student, who has domiciled himself in Fiji. We should be glad if all who have left the College would communicate their whereabouts and their doings to us:—

"Samabula, Fiji, 10th April, 1907.

"DEAR MR. MAHON,—On more than one occasion you have sent to my home on Buderim inquiring what I was doing. I never replied, because I was in Fiji. At present, I am managing a banana plantation. I have about twenty Fijian natives and a few Indian coolies; the Fijians chip, and the coolies plough and scuffle.

"I am thinking of very shortly starting a dairy. Butter sells freely here at 1s. 6d. per lb. Land is cheap, and so is labour. Cattle, of a sort, are plentiful and fairly cheap. The people here know nothing about dairying; everybody goes in for cane and bananas. There are eight large sugar-mills on the island. The C.S.R. Company imported a lot of cattle for working; the cattle give very poor milk and not much of it, but that is mainly the fault of the feed. There is no good natural grass, but paspalum does fairly well, though lucerne will not grow at all. The bulk of the cattle are owned by the coolies, and they inbreed so much that the stock are very small. You can buy two-year-old beasts for about £1 10s to £2 per head. What is badly wanted here is a stock inspector to go round and condemn them for tuberculosis, as they suffer from it very badly. Before I start, I want to get a purebred Shorthorn or Holstein bull, but the great difficulty is knowing where to obtain one. New Zealand is too dear, and beasts from there do not thrive when they get here, the climate being too much for them, and, as a rule, they are all stall-fed beasts. To import from Queensland, there are the tick restrictions to overcome. They will not let a beast land unless he has a certificate to say he is absolutely free from ticks. Then there is the trouble of getting him on to the steamer. Do you think you could get one of the College bulls shipped by the mailboat from Brisbane with a stock inspector's certificate guaranteeing him free from ticks? If you think you can do so, let me know what it will cost f.o.b. In the event of this being impossible, could you give the name of some southern breeder, of either breed, and I will write to him? I would prefer a College bull, as they are not too much pampered. From the Queensland papers I get over, I see that you are having good seasons, so everything on the College ought to be looking well. Droughts are unknown over here, and there is no cold weather to stop the grass growing in winter. At the same time, it is not so hot as it is in many parts of Queensland; all through last summer it never went over 100 degrees.

"There are several old College chaps over here. Bray was here, but he left to go dairying in New South Wales. W. Burns is here, and another student whom I never knew.

"Trusting that you are quite well, I remain, Yours sincerely,

"A. P. FOUNTAIN."

[With respect to Mr. Fountain's request for a Shorthorn or Holstein bull from Queensland, the latest information received from Fiji is, that the authorities there prohibit the importation of stock from Queensland. Still,

as the prohibition is for the purpose of preventing the introduction of ticks, the difficulty could easily be got over by dipping any stock intended for export to Fiji. They could then, with absolute certainty, be declared free from ticks. Stock can be dipped, or either sprayed, which is better still, at the Departmental crush, which is close to the wharf, so that stock could be shipped straight on to the boat, without again leaving the town or mixing with other beasts. It would only then remain for Mr. Fountain, having the Department's certificate to the effect that the animal is perfectly clean, to arrange for its entry into Fiji.—Ed. "Q.A.J."]

TO GET RID OF COCKROACHES.

Pestered as all tropical countries are with cockroaches, any suggested remedy to get rid of them is worthy of a trial. The "Ceylon Tropical Agriculturist" has the following on this subject:—

REMEDIES AND METHODS OF DEALING WITH COCKROACHES IN THE HOUSE.

In ordinary cases, the different methods of poisoning are to be recommended. Smith, in his "Economic Entomology," says that he has found equal parts of powdered chocolate and borax, ground up thoroughly in a mortar, so that it is well mixed, and placed in their runs, very effective in getting rid of the cockroaches. Other writers advise the use of phosphorous paste, which is simply sweetened flour paste, containing 2 per cent. of phosphorous; this is spread on bits of wood or cardboard and placed in all the sheltered corners where the roaches congregate. During the last outbreak of plague, this mixture was distributed all over Sydney as rat poison, but I believe it killed an immense number of large American cockroaches wherever it was placed under the floors or cellars.

Borax with many different forms of food is used, but Mr. Tepper has recommended another method of inducing roaches to commit suicide. He first places a saucer containing 1 part of plaster of Paris to 4 of flour, well mixed, and close to it a saucer full of water, with a few sticks resting against the saucers, so that they can easily get to the food and water. The roach becomes thirsty after flour and plaster diet, and goes for the water, with the result that he gets small bricks in his inside that kill him.

An earthenware crock containing a few inches of stale beer, for which cockroaches have a great liking, and then a few handy sticks resting against the jar, so that they can climb up to get at the fluid, will often destroy great numbers.

The most successful method, where a large place is infested, is fumigation with hydrocyanic acid gas, which, if properly applied, penetrates into every corner, and suffocates big and little, most of them coming out of their hiding places and dying on the floor, where they can be swept up in the morning and burnt, as where the fumigation has been weak, it is sometimes found that the roaches revive. For such fumigation, 1 lb. of cyanide of potassium to 1 pint of sulphuric acid and 3 pints of water will generate enough gas to poison 1,000 cubic feet of space. Bisulphide of carbon is sometimes used, but hydrocyanic acid gas has several advantages: First, it is not inflammable; secondly, it rises up on all sides, and is very volatile, while bisulphide, being a heavy gas, sinks down, and if not used in sufficient strength will leave a stratum of unpoisoned air just where it is wanted most; and, lastly, the vile smell of bisulphide will hang round for some time after the room has been opened out, while hydrocyanic acid gas soon mixes with the air, and leaves no smell of any consequence behind. Riley considers that burning pyrethrum, or insect powder, will paralyse them, and even when it is simply scattered about on the shelves or corners, or puffed into cracks and crevices, will soon clear them out; but its virtue is but temporary, and it not only makes a mess on

shelves and cupboards, but is an expensive remedy in large premises. Paris green is another very good thing to drive cockroaches away. It is scattered about or puffed into the corners where they hide, and is a more lasting poison than pyrethrum, but from its poisonous nature should be used with care and not left exposed. At the back of book-shelves and presses it is one of the best for roaches, silver-fish, and other insects of this class.

Burning black gunpowder in the infested kitchens is practised in Germany. The powder is damped and made up into little cones—"spitting jennies" we used to call them as boys. The fumes soon bring out the cockroaches, when they can be swept up and destroyed.

Mr. T. A. Janvers, writing in "Scribner's Magazine," March, 1889, on "Mexican Superstitions and Folk Lore," says that the following is a formula practised by the Mexican villagers to get rid of cockroaches:—"Catch three and put them into a bottle, and so carry them to where two roads cross. Here hold the bottle upside down, and, as they fall out, repeat aloud three *credos.* Then all the cockroaches in the house from which these three come will go away.

How to get Rid of Cockroaches.

In answer to a correspondent, Mr. W. W. Froggatt, Entomologist to the Department of Agriculture, supplies the following note:—

An article dealing with cockroaches appears in this issue of the "Gazette." Among the remedies used in the ordinary house where the run or hiding places of the pests are located, is to puff in Paris green. An excellent bait is powdered chocolate and borax, equal parts; grind it up in a mortar, so that it is thoroughly mixed; dust this into their hiding places or place in bunches here and there, covering up all food at the same time.—"Agricultural Gazette of New South Wales."

DESTRUCTION OF SLUGS AND SNAILS.

We have been asked for a remedy against the slugs (*Vaginula*) which are so plentiful during the months of April and May. There are some apparently good remedies which are given in the "Agricultural News" of Barbados (7th February, 1907).

The following, taken from Circular 53 of the "Comision dé Parasitologia Agricola," Mexico, 1906, indicates some of the methods that have been found useful in dealing with snails and slugs which are at times a serious pest in that country:—

The collection of snails by hand has been tried and found successful. The best times for the practice of this method are at the beginning and end of the rainy season.

Pieces of board smeared with fat on the underside are laid down in infested places, with room beneath for the snails to collect. Cabbage leaves with rancid butter on one side, melon rinds, and the leaves of the common acacia are useful in attracting the snails.

For trapping slugs a very useful trap may be made of earthen flowerpots provided with a cover and having a row of holes round the middle. These pots are sunk into the ground so that the holes come about at the surface. The inside of the pot is smeared with beer, a small amount of which is put into a dish at bottom.

Another useful trap is made of a cone of galvanised iron, with many perforations, which is sunk into the ground, leaving only the top row of holes above the surface. Pieces of potato, carrot, and apple have been found to be attractive baits in this trap.

When snails and slugs have been trapped, they may be killed by being left for five hours in a 5 per cent. solution of copper sulphate in water, or a 2 per cent. solution of lime in water.

These pests may be kept away from a nursery or garden plot by means of a rope of twisted grass or fibre soaked in a 10 per cent. solution of copper sulphate and stretched around the border. Bands of cloth soaked in this solution and fastened around the trunks of trees may be used to prevent the ascent of slugs and snails, while a solution of iron sulphate, 25 per cent. to 50 per cent., applied in a ring 4 inches wide around the trunk of the tree, is said to stop the passage of these small animals. They may be killed in weeds, hedges, &c., by spraying with a 1 per cent. to 4 per cent. solution of copper sulphate, or a 1 per cent. solution of common salt.

Snails and slugs are eaten by geese, and the species of one genus of carnivorous snails (*Glandina*) are known to attack those that feed on plants.

THE NAME "CASTILLA."

In a paragraph we printed in the September issue of the Journal for 1906, on the packing of rubber seeds, we wrote "Castilla" instead of "Castilloa," and were taken to task for this etymological error. In a recent issue of the "Mexican Investor," however, we find the following notes, which go to show that Castilla is the correct spelling of the word:—

I wish first to explain why I am persistently using the generic name Castilla instead of Castilloa, to which most persons are accustomed. I go on the principle that everything should be called by its true name. The right name of the Central American rubber-tree is Castilla. It was first described and named by the botanist Cervantes in 1794, and the description was printed the same year in "Suplemento á la Gaceta de Literatura." It is here written "Castilla," and the tree was named thus in honour of the Spanish botanist Castilla, who had died the previous year, while he was working on a flora of Mexico. In 1805 an English translation of the paper was published anonymously, and now the name was changed to "Castilloa." The translator (who is believed to have been Charles Koening, the keeper of the Mineralogical Department of the British Museum) had no right to alter the name. A Mexican botanist had already, with just as little right, proposed to change the name to "Castella" shortly after the plan had been described. Now, we have in systematic botany certain recognised rules of nomenclatures, and one of these is that of priority. As Castilla was the first name given, it should remain so. This question was discussed and settled in 1903 by O. F. Cook, in "The Culture of the Central American Rubber."

Mr. F. M. Bailey, Government Botanist, Queensland, considers that the immutable law of priority of nomenclature should be always observed, and, as Castilla was the name first given to this class of rubber-tree, it should remain so.

PLOUGHING BY COMPASS.

Agriculturists will be amused and also genuinely interested in the feat of Captain Sycamore, the man who sailed Sir Thomas Lipton's yacht "Shamrock" in the races for the America Cup. Not the sea, but the land, is the scene of his latest exploit. Ploughing matches were being held at Brightlingsea, Essex, when the captain was challenged to draw a furrow with Mr. Reginald Girling, a well-known farmer. The rôle was entirely new to the captain, but there was a charm of novelty in the attempt, and he accepted the challenge. Used to steering by compass at sea, Captain Sycamore decided to continue its use on land. He accordingly fastened one to the plough, and the horses were started. It was an exciting time, and few expected to see the gallant sailor beat the farmer. He steered his plough, and guided his team straight as the needle to the pole. His adversary made a gallant attempt with wrist and eye to beat him, but the judge easily placed Captain Sycamore the winner. His furrow was drawn with scarcely a variation.—"Silverwood Gazette."

POTATO-DIGGING MACHINE.

Germany is the largest potato-producing country in the world. She grows from 35,000,000 to 48,000,000 tons of potatoes annually. The work of harvesting this immense crop comes in the cold and wet days of October, November, and as late as December. Until quite recently this work has been done by hand, but of late years several more or less successful potato-digging machines have been tried, and the tendency is strongly towards the use of such machinery.

In connection with the above, we would point out that a potato-digger has been invented in Queensland by Mr. F. Daniells, which, at its trials, is said to have done the work of turning out and grading the potatoes most satisfactorily. The machine is a very neat, compact, and business-like looking affair, and can be drawn easily by two medium-sized horses. We understand that, notwithstanding its standing the test of several trials to the satisfaction of farmers who were present, and who, we are told, actually gave orders for several machines, Mr. Daniells has been obliged to take his invention south, where he expects to find Victorian farmers more alive to their own interests than the Queensland farmers, who are so conservative as still to harvest their potatoes by means of the plough or the digging-fork.

AMOUNT OF WATER REQUIRED BY VARIOUS CROPS.

Investigation by Professor F. H. King has shown that to produce an average acre of clover or potatoes at least 400 tons of water are needed for the season; for an acre of peas, wheat, or oats, 375 tons; for an acre of Indian corn, 300 tons; while to bring an acre of sunflowers to maturity at least 6,000 tons of water are needed—*i.e.*, 12,000,000 pounds of moisture. One investigator holds that at least 615 tons of water are taken up in producing 2½ tons of grain. Ordinary field crops transpire about 300 lb. of water for each pound of dry matter produced.

Now, as 1 inch in depth of water over an acre weighs 113 tons, it follows that the water required to produce 1 ton of hay must be supplied to a depth approximately of from 3 to 5 inches. Sometimes far more is required. For instance, the actual amount used in producing 5 tons of barley hay to the acre has been about 20 inches in depth.

A NEW USE FOR MOLASSES.

A correspondent of the "Bundaberg Mail" lately addressed the following letter to that journal:—

It is surprising how few people are acquainted with the real nature and properties of molasses. Even men who have worked in sugar-mills and distilleries for years often betray ignorance in this respect. The writer had occasion some time ago to scientifically investigate the properties of molasses, and found it a very difficult problem to burn off a large quantity of surplus molasses without the aid of specially constructed furnaces. Molasses is not the highly inflammable mixture that people imagine it to be. It would be practically impossible to set a tank of molasses on fire by any means whatever. Even a mixture of molasses and methylated spirits or sulphur will burn very imperfectly at first, and finally smoulder and die out. A charge of molasses will extinguish or damp down the strongest furnace fire in a few minutes. A jet of molasses played on burning wood will instantly extinguish the fire, and the wood cannot be again fired until the molasses is removed from the surface. For extinguishing large tanks of burning oil, kerosene, or spirit, there is nothing more effective than bags or tarpaulins steeped in molasses, and when such tanks are in danger of being fired they should be covered over and made airtight with tarpaulins that have previously been immersed in heavy molasses.

A NEW MILKING MACHINE.

This Journal is not a comic paper, but "a little nonsense now and then is relished by the wisest men." Here is a little bit from an American paper:—

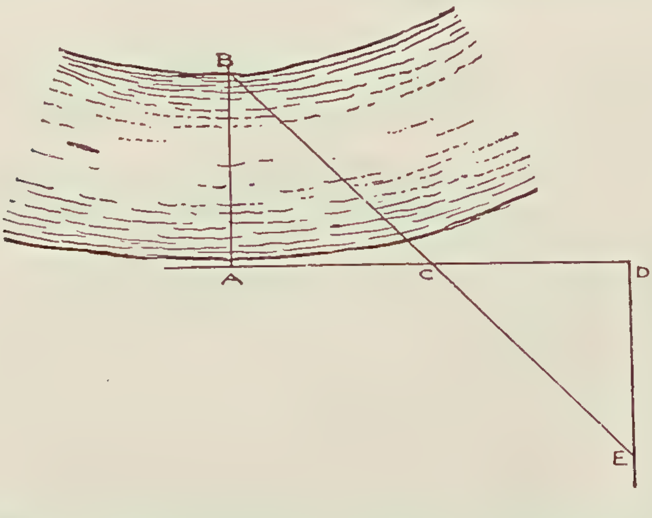
A new milking machine has just been invented, and is said to be in successful operation at Dayton, Ohio. It is an electric motor which fastens to the rump of the cow, the electricity being generated by a small dynamo attached to her tail. She switches her tail, the dynamo starts, and by means of a bevel gear and block and tackle the milk is extracted, strained, and the pail and strainer hung up to dry. A small phonograph accompanies the outfit, and yells "so" every time the cow moves. If she lifts her foot to kick, a little dingus slides over a whatnot, and the phonograph yells——! If she contrives to kick, a hinged arm grabs up the milk stool and "lams" her on the back.

ALCOHOL *V.* GOOD HEALTH.

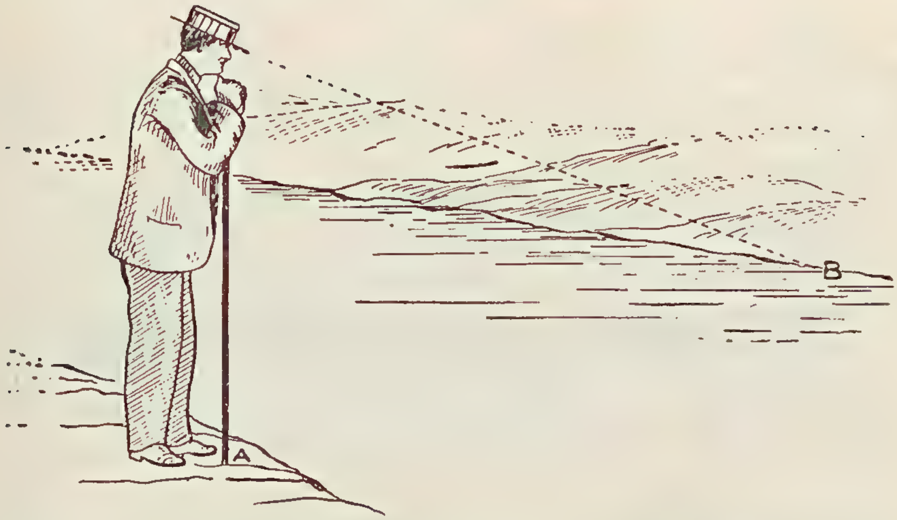
There is a great desire on the part of all young men to be "fit." A young man cannot be fit if he takes alcohol. By no possibility can he want it. No one who is young and healthy can want alcohol any more than he can want strychnine. The effect of alcohol lasts only for a moment, and after it has passed away the capacity for work fails. Alcohol brings up the reserve forces of the body and throws them into action, with the result that when these are used up there is nothing to fall back upon. Alcohol produces an increased heart-beat, a fuller pulse, and a redder skin. It calls upon the reserve power of the organ, but the moment the effect has passed off the action of the heart is actually weakened.—Sir Frederick Treves, in the "Young Man."

MEASURING THE WIDTH OF A RIVER.

Let A be an object close to the river. A tree or stone will do, or a stake may be put in the ground at the water's edge. Then select an object (B) on the other side of the river directly opposite to A. It may be more convenient to select B first. Now, draw a straight line (A C) at right angles to A B, of any



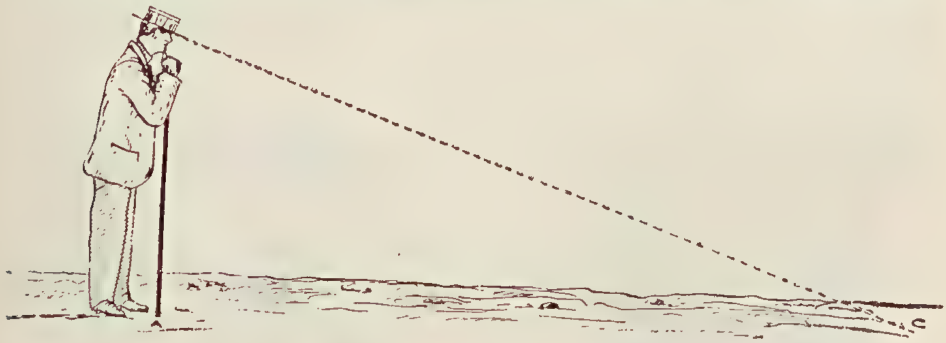
convenient length, and fix a picket at C. Carry on this straight line A C to a point D, so that C D may be equal in length to A C. From D draw a straight line at right angles to A D, and on this line find the point E, which will



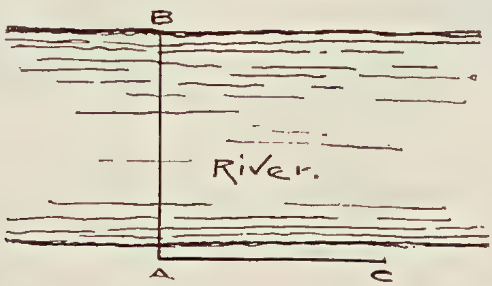
bring B C E in a straight line. Now, you have two triangles, one (C D E) on the land, and the other (C A B) on the water. These triangles are equal in every respect, and D E is equal to A B. We can, therefore, measure D E, which will give us the length of A B—that is, the breadth of the river.

ANOTHER APPROXIMATE METHOD.

Stand on the bank of the stream, facing it, and rest your hands on a stake at the height of your chin. Keep perfectly steady, and tilt the rim of



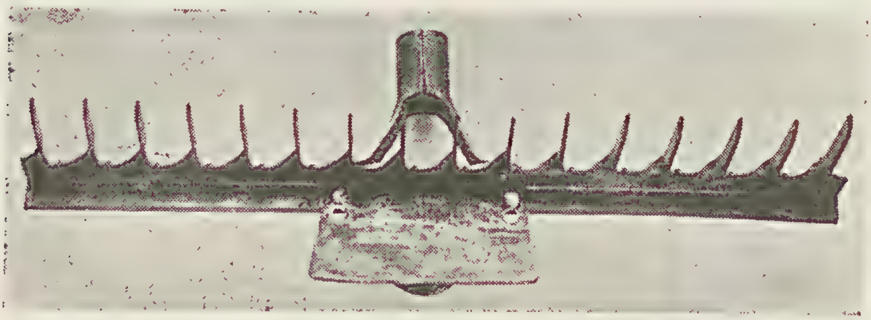
your hat until it is in line with the opposite bank. Then turn steadily to the right or left, and note the spot on the bank which coincides with the rim of



your hat. The distance between the stake and this spot will be the approximate width of the stream.

A HANDY RAKE.

The rake here depicted is the contrivance of Mr. G. A. Patullo, of the Government Printing Office. Its use saves the employment of a second garden tool in the shape of a hoe. When a gravelled path has been chipped and the gardener rakes up the weeds, he usually finds that tufts of couch or some other



weed have been missed. Under ordinary circumstances he would have to put aside the rake and fetch a hoe. This contrivance saves that trouble. A piece of an old Dutch hoe is riveted to the front of the back of the rake at right angles to the teeth. When any unchipped weed is met with, all that need be done is to turn the rake over and use the hoe portion. All such little contrivances are valuable as labour-savers.

NEW EGG-CARRIER.

A device for the carriage of settings of eggs by post has been patented by Mr. H. E. MacDonald, of Wellington. The illustration shown here will give an idea of the simplicity and construction of the contrivance. The New Zealand Agricultural Department has, after an exhaustive trial, decided to adopt this box for the coming season.

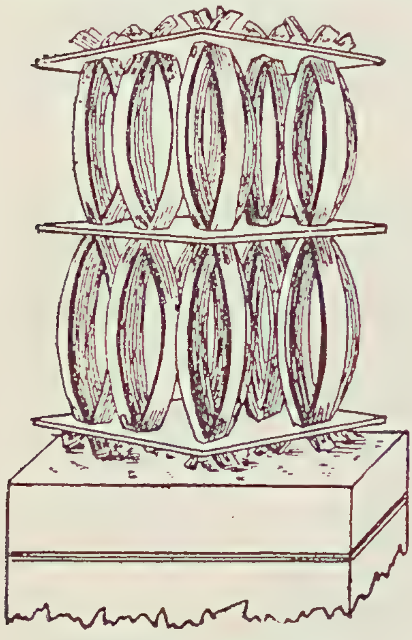


FIG. 1.—Carrier Empty.

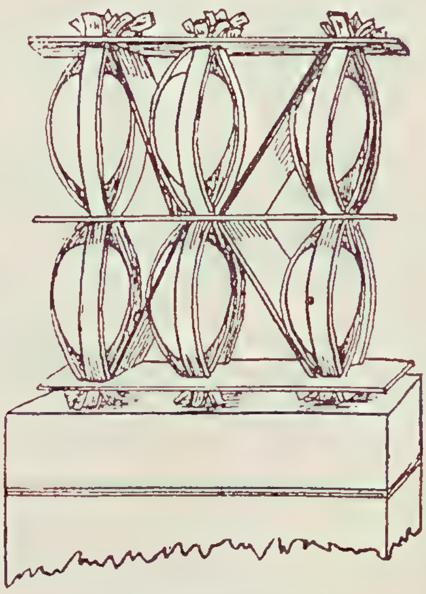


FIG. 2.—Carrier Full.

In the illustrations the carrier is standing on top of the cardboard box, which envelopes it when the eggs are being carried to their destination.

Answers to Correspondents.

THE MILKY MANGROVE.

A correspondent writes to say that he has lost some of his dairy stock, poisoned, as he believes, by eating the "milky mangrove." This tree exudes a highly poisonous milky sap. In his book on "Plants Reputed Poisonous and Injurious to Stock," Mr. F. M. Bailey, Colonial Botanist, describes it, under the head of the order Euphorbiaceæ, as *Excœcaria agallœha,* a small crooked tree, met with on the borders of tidal rivers and coast swamps in Queensland, Tropical Asia, &c. Cattle seldom browse on it, yet, when in times of scarcity they have eaten it, it has been suspected of causing their death. Some years ago one of Mr. J. G. Cribb's children was nearly killed by sucking the milk of this tree by mistake for fig-tree sap.

HEIGHT OF A LIGHT.

BOATMAN, Caloundra.—

Question.—I want to put up a light to show at a certain distance. Can you tell me how high above sea-level I should place it so as to be visible 10 miles off?

Answer.—Multiply the number of miles by itself and also by 4, and divide the product by 7. Thus, a lamp required to show 10 miles away—

$$10 \times 10 = 100 \times 4 = 400 \div 7 = 57\tfrac{1}{7}.$$

Your light should, therefore, be $57\frac{1}{7}$ feet above sea-level or above your level plain country.

LICE ON PIGS.

J. WILSON, Gayndah.—

The remedy is simple. Wash the animals with a solution of kerosene and water. A New Zealand paper, "The Farmers' Union," says that this is infallible. The same paper tells a correspondent that

THE DEAD WEIGHT OF AN ORDINARY PIG

is seven-ninths of the live weight.

RED SCALE ON CITRUS TREES.

G. H. BUCHANAN, Don River, Bowen.—

In reply to your inquiry as to measures for coping with red scale on citrus trees, Mr. Tryon, Entomologist and Vegetable Pathologist to the Department of Agriculture and Stock, replies:—

(1.) Paris green is not recommended, since it is not a material that kills by contact, and is, therefore, not available for destroying scale insects that, living by suction, need for their destruction some substance that does so.

(2.) Unless cyaniding can be resorted to—a procedure that is wholly efficacious in killing red scale insects—the use of resin and soda wash (of Koebele) is recommended. This is prepared as follows:—

Ingredients: Resin, washing soda (carbonate of soda), and water.

Quantities to make 3 gallons of wash: Resin, 4 lb.; washing soda, 3 lb.; water, 5 gallons.

Mode of Manufacture: (1) Boil (in a utensil holding 5 gallons) resin and soda in 1 gallon of water until all the former has dissolved. Then (2) add

gradually 4 gallons of *warm* water, stirring all the time, and continue the boiling until the mixture is the colour of molasses. This gives the stock mixture.

Mode of Manufacture: (1) Boil (in a utensil holding 5 gallons) resin and to every 5 parts of water (preferably warm), and spray the resulting mixture over the trees, using a Vermorel nozzle attached to the sprayer employed.

It is essential for success that the resin and soda wash reach the parts to which it is applied in the form of a very fine mist, sufficiently dense to wet everything without there being any running down; also, that the application be repeated once or twice, since, owing to the gradual manner in which the active young hatch from the parent scale insects, fatal results cannot be expected from a single one.

To the above, Mr. Tryon adds:—

A related spraying fluid has been devised in California for subduing scale insects. This is given in one of Mr. A. H. Benson's pamphlets amongst other publications, and is prepared as follows:—

Take 20 lb. of resin, 6 lb. of caustic soda (70 per cent.), 3 pints of whale oil, water to make 80 gallons. Place the resin, caustic soda, and fish oil in a large boiler with 20 gallons of water, and boil for 3 hours. Then add hot water slowly, and stir well till there are at least 40 gallons of hot solution; then add cold water to make up the total to 80 gallons. Never add cold water when cooking, or the resin will be precipitated, and it will be difficult to get into solution. The above is the strength to use for citrus trees. Four pounds of whale-oil soap can be used in place of 3 pints of whale oil, if wished, in which case the caustic soda can be reduced from 6 lb. to 5 lb.

DOES RINGBARKING IMPROVE GRAZING LAND?

A. D., Abbotville.—

Yes. It lets the light and air in, and more moisture is retained in the soil, owing to the inability of the dead trees to absorb it. Hence the grass improves in quantity and quality.

DESTROYING JOHNSTON GRASS.

FARMER, Woodford.—

Several methods are recommended. One is, to plough the ground in autumn, harrow it in spring, then cut all young sprouts $1\frac{1}{2}$ to 2 inches below the surface. Repeat the cutting next month, after which the grass is destroyed. An American, Mr. S. Y. Trice, Dallas, Texas, guarantees a secret mixture which will completely destroy Johnston grass after one ploughing and harrowing. Two gallons of the mixture are added to 40 gallons of water, and placed in a sprayer behind the plough, the land being sprayed as the plough moves along. Forty gallons of the solution are sufficient for one acre; cost, 8s. 4d. A farmer in the Bundaberg district had a quantity of Johnston grass in his lucerne field. He stated that it is easily got rid of by constant cutting. This is open to grave doubt. It is said that paspalum will destroy Johnston or any other grass.

BANANA PLANTING.

A. B. C., Mirani.—

The best time to plant bananas is just about the beginning of the rainy season—January—as the young suckers require moisture to strike root. The holes should be at least from 1 foot to 2 feet deep and from 1 foot to 18 inches in diameter. Cavendish bananas may be planted from 12 to 16 feet apart, but large-growing varieties, such as sugar and lady's finger, require from 20 to 25 feet apart. See Benson's "Fruits of Queensland."

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JUNE. Prices.
Apples, Eating, Local, per packer	4s. 6d. to 8s.
Apples, Cooking, Local, per packer	4s. to 7s. 6d.
Apricots, Local, per packer	...
Bananas, Local, per dozen	...
Bananas, Local, per bunch	6d. to 1s.
Bananas, Fiji, per case	...
Custard Apples, per quarter-case	2s. 6d. to 4s.
Cape Gooseberries, per quart	...
Grapes, per lb.	...
Lemons, Local, per packer	2s. 6d. to 6s.
Mandarins, Local, per packer	2s. 6d. to 4s. 6d.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges, per packer	2s. to 3s.
Papaw Apples, per case	...
Passion Fruit, per quarter-case	...
Peaches, per case	...
Peanuts, per lb.	$2\frac{1}{2}$d. to $2\frac{3}{4}$d.
Pears, Imported, per case	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	4d. to 2s. 4d.
Pineapples (smooth leaf), per dozen	1s. 6d. to 4s.
Plums, quarter-case	...
Quinces, per case	...
Rockmelons, per dozen	...
Rosellas, per bag	1s. to 1s. 3d.
„ per quarter-case	6d. to 9d.
Strawberries, per tray	...
Tomatoes, per quarter-case	6d. to 1s. 3d.
Watermelons, per dozen	...
SOUTHERN FRUIT MARKET.	
Apples, Tasmanian, per case	5s. to 6s. to 7s.
„ Other, per bushel case	3s.
Bananas, Queensland, per case	9s. to 10s.
„ „ per bunch	1s. 6d. to 2s.
„ Fiji, per case	12s. 6d. to 13s. 6d.
„ „ per bunch	4s. to 9s.
Chillies, per bushel	...
Grapes, per box	...
Lemons, Ordinary, per gin case	3s. 6d. to 4s.
„ Medium to good, per gin case	...
„ Extra choice „ „	...
Mandarins, per case	1s. 6d. to 4s.
Oranges, Queensland, per case	3s. to 4s. 6d.
Pears, Victorian Vicars, per box	3s. to 5s.
Persimmons, per half-case	2s. 6d. to 4s. 6d.
Pineapples, per case	...
„ choice, per case	5s. to 6s.
„ Queensland, choice	5s. to 6s.
Passion Fruit, per gin case	3s. to 3s. 6d.
Quinces, per gin case	1s. 6d. to 2s. 6d.
Strawberries, per dozen punnets	...
Tomatoes, per half-case	2s. 6d. to 4s.
Watermelons, Queensland, per dozen	...
„ medium	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JUNE.

Article.		JUNE. Prices.
Bacon (Pineapple)	lb.	7d. to 8½d.
Barley (Malting)	...	...
Bran	ton	£5 to £5 10s.
Butter, Factory	lb.	10¼d.
Chaff, Mixed	ton	£4 to £4 15s.
Chaff, Oaten	„	£4 5s. to £4 15s.
Chaff, Lucerne	„	£4 12s. 6d. to £5 7s. 6d.
Chaff, Wheaten	„	£2 18s. 6d. to £3 5s.
Cheese	lb.	6½d. to 7d.
Flour	ton	£9.
Hay, Oaten	„	£5 15s. to £6.
Hay, Lucerne	„	£4 to £5.
Honey	lb.	1¾d. to 2d.
Maize	bush.	2s. 8d. to 2s. 9d.
Oats	„	2s. 11d. to 3s.
Pollard	ton	£5 17s. 6d. to £6 2s. 6d.
Potatoes	„	£3 3s. 9d. to £4 10s.
Potatoes (Sweet)	„	...
Pumpkins	„	...
Wheat, Milling	bush.	...
Wheat, Chick	„	3s. 3d. to 3s. 10d.
Onions	ton	£4 to £4 2s. 6d.
Hams	lb.	10½d.
Eggs	doz.	1s. 1½d. to 1s. 3d.
Fowls	pair	1s. 11d. to 3s. 8d.
Geese	„	4s. 3½d. to 4s. 10d.
Ducks, English	„	2s. 5d. to 2s. 10d.
Ducks, Muscovy	„	2s. 6d. to 3s. 6d.
Turkeys, Hens	„	5s. to 6s.
Turkeys, Gobblers	„	8s. to 12s. 6d.

ENOGGERA SALEYARDS.

Animal.	MAY. Prices.
Bullocks	£9 to £10 17s. 6d.
Cows	£7 15s. to £9 12s. 6d.
Merino Wethers	21s.
C.B. „	24s. 3d.
Merino Ewes	18s.
C.B. „	24s. 6d.
Lambs	17s. 6d.
Pigs (Baconers)	42s.
„ (Porkers)	34s.
„ (Slips)	13s. 6d.

Farm and Garden Notes for August.

This and the following two months are about the busiest periods of the year so far as work in the field is concerned; and the more activity now displayed in getting in the summer crops, the richer will be the reward at harvest time. Potatoes should be planted, taking care to select only good sound seed that has sprouted. This will ensure an even crop. Yams, arrowroot, ginger, sisal hemp, cotton, and sugar-cane may now be planted. Sow maize for an early crop. If the seed of prolific varieties is regularly saved, in the end it will not be surprising to find from four to six cobs on each stalk. This has been the experience in America, where the selecting of seeds has been reduced to a fine art. In choosing maize for seed, select the large, well-filled, flat grains. It has been shown that by constantly selecting seed from prolific plants as many as five and six cobs of maize can be produced on each stalk all over a field. A change of seed from another district is also beneficial. Sow pumpkins, either amongst the maize or separately, if you have the ground to spare. Swede turnips, clover, and lucerne may be sown, but they will have to contend with weeds, which will begin to vigorously assert themselves as the weather gets warmer, therefore keep the hoe and cultivator constantly going in fine weather. Tobacco may be sown during this month. If vines are available, sweet potatoes may be planted towards the end of the month. In this case, also, it is advisable to avoid too frequent planting of cuttings from the old vines and to obtain cuttings from other districts. If grasses have not yet been sown, there is still time to do so, if the work be taken in hand at once. Sugar-cane crushing will now be in full swing, and all frosted cane in the Southern district should be put through the rollers first. Plough out old canes, and get the land in order for replanting. Worn-out sugar lands in the Central and Northern districts, if not intended to be manured and replanted, will bear excellent crops of sisal hemp. Rice and coffee should already have been harvested in the North. The picking of Liberian coffee, however, only begins this month. Collect divi-divi pods. Orange-trees will be in blossom and coffee-trees in bloom for the second time. As this is generally a dry month in the North, little can be done in the way of planting.

Kitchen Garden.—Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnip, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbge plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

Flower Garden.—All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season

arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragon), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2·63 inches, and for September 2·07 inches, increasing gradually to a rainfall of 7·69 inches in February.

Orchard Notes for August.

By ALBERT H. BENSON.

The planting of deciduous trees should be completed by the end of this month in all parts of the State, but evergreen trees can be transplanted during seasonable moist weather at any time of the year if the operation is carefully carried out. When set out, the young trees must be cut hard back to a height that in no case should exceed 2 feet from the ground, and in warm dry districts half of this height is to be preferred. Cutting back at planting insures a strong and vigorous young growth, whereas by neglecting to cut hard back at planting the future growth, vigour, and symmetry of the tree are greatly impaired if not completely spoilt. The pruning of all deciduous trees must also have been completed; and all citrus fruit trees from which the fruits have or should have been gathered should be gone over carefully, all dead and badly diseased wood should be removed, and any crossing or superfluous branches, or water sprouts, should be cut away. When the trees are badly attacked by scales, this pruning should be severe, in order that the remedies used for dealing with these pests may have a fair chance, as when the top of a citrus tree is allowed to grow like a mat it is impossible to get the spraying material on to the parts where it is most wanted. Spraying should be systematically carried out in every orchard in the State during this and the preceding month, and in the case of fungus diseases on deciduous trees during the following month as well. Spraying is just as essential an operation as the gathering of the fruit; and no fruit-grower who wishes to make fruit-growing a success can afford to neglect it, as it is impossible to breed disease in fruit trees and to grow fruit profitably at one and the same time. A full description of the operation of spraying and of the most approved remedies was published some time ago in pamphlet form by the Department of Agriculture, so that any grower who has not received a copy and who desires to obtain the necessary information may obtain it by writing to the Department. After pruning and sparying, the orchard should be ploughed; so that all weeds and trash can be buried, and also that the land that has been trodden down firm shall be broken up. Use a short American plough that will take a wide furrow and turn it right over. The depth at which to plough will depend on the treatment the orchard has previously received and on the nature of the soil. If the soil is shallow, or if the land has never been worked, then the ploughing must be shallow or the roots will be badly injured; but where there is plenty of soil and a perfect subdrainage, then the ploughing can be from 4 to 6 inches in depth (provided the land has been previously cultivated) without any injury to the trees. In fact, in such soil surface roots are not required, and the trees stand dry weather best when deeply rooted.

Quick-acting artificial manures, such as sulphate of ammonia, sulphate of potash, or superphosphate, can be applied during the month, but care should be taken not to apply too large a quantity at once, as, owing to their extreme solubility, a considerable portion of them is apt to be washed out and lost by heavy rains. In conclusion, one more word about spraying, and that is: Do your utmost to stamp out diseases in new districts as soon as ever they make their appearance. Do not consider any disease too trivial, and that it can be well let alone to a more convenient time, as the more convenient time will not come; but the disease will flourish and spread rapidly, so that what might have been checked, if not eradicated, by half an hour's work will now take the grower all he knows to get the better of it. In spraying, whether for insects or fungi, a knowledge of the pest to be treated, combined with carefulness and promptitude, are the essentials of success.

In notes of this kind it is impossible that they can apply equally to every part of the State, but they will be found to be about an average. Very early districts will sometimes require the notes of a month later, and very late districts those of a month earlier.

Times of Sunrise and Sunset at Brisbane, 1907.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·13	5·17	6·30	5·1	6·39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·4	6·30	5·19
3	6·14	5·15	6·31	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·29	5·20
5	6·15	5·14	6·32	5·0	6·39	5·5	6·28	5·20
6	6·16	5·13	6·32	5·0	6·39	5·5	6·27	5·21
7	6·16	5·12	6·33	5·0	6·39	5·6	6·27	5·21
8	6·17	5·12	6·33	5·0	6·39	5·6	6·26	5·22
9	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
10	6·18	5·10	6·34	5·0	6 39	5·7	6·24	5·23
11	6·18	5·10	6·34	5·0	6·39	5·7	6·24	5·23
12	6·19	5·9	6·35	5·0	6·39	5·8	6·23	5·24
13	6·20	5·8	6·35	5·0	6·38	5·8	6·22	5·24
14	6·20	5·8	6·36	4·59	6·38	5·9	6·21	5·25
15	6 21	5·7	6·36	4·59	6·38	5·9	6·20	5·25
16	6·21	5·7	6·36	5·0	6·38	5·10	6·19	5·26
17	6·22	5·6	6·37	5·0	6·37	5·10	6·18	5·26
18	6·23	5·6	6·37	5·0	6·37	5·11	6·18	5·27
19	6·23	5·5	6·37	5·0	6·37	5·12	6·17	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·16	5·28
21	6 24	5·4	6·38	5·0	6·36	5·13	6·15	5·28
22	6·25	5·4	6·38	5·1	6·35	5·13	6·14	5·29
23	6·25	5·3	6·38	5·1	6·35	5·14	6·13	5·29
24	6·26	5·3	6·38	5·1	6·35	5·14	6·12	5·30
25	6·26	5·2	6·39	5·1	6·34	5·15	6·11	5·30
26	6·27	5·2	6·39	5·2	6·33	5·15	6·10	5·31
27	6·27	5·2	6·39	5·2	6·33	5·16	6·9	5·31
28	6·28	5·2	6·39	5·2	6·32	5·16	6·8	5·32
29	6·28	5·1	6·39	5·3	6·32	5·17	6·7	5·32
30	6·29	5·1	6·39	5·3	6·31	5·17	6·6	5·32
31	6·30	5·1	...	...	6 31	5·18	6·5	5·33

PHASES OF THE MOON.

			H. M.
5 May	☽	Last Quarter	7 53 a.m.
12 „	●	New Moon	6 59 p.m.
20 „	☾	First Quarter	11 27 „
28 „	○	Full Moon	0 18 a.m.
3 June	☽	Last Quarter	3 20 p.m.
11 „	●	New Moon	9 50 a.m.
19 „	☾	First Quarter	0 55 p.m.
26 „	○	Full Moon	7 27 a.m.
3 July	☽	Last Quarter	0 34 a.m.
11 „	●	New Moon	1 17 „
18 „	☾	First Quarter	11 12 p.m.
25 „	○	Full Moon	2 29 „
1 Aug.	☽	Last Quarter	0 25 p.m.
9 „	●	New Moon	4 36 „
17 „	☾	First Quarter	7 5 a.m.
23 „	○	Full Moon	10 15 p.m.
31 „	☽	Last Quarter	3 28 a.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	Rockhampton.		Townsville.		Cooktown	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
May	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.
August	5 m.	15 m.	18 m.	36 m.	16 m.	46 m.

Agriculture.

FARM SETTLEMENT IN QUEENSLAND.

The present flourishing condition of the agricultural and dairying industries in Queensland contrasts remarkably with the conditions under which farming (for there was no dairying as a separate business) was carried on in what may be called the olden times when those "Pilgrim Fathers," the German missionaries, and the brave immigrants who came in the ship "Fortitude" laid the foundations of the industry in the neighbourhood of Brisbane and in the wild bush surrounding what are now the populous and thriving districts of Nundah, Nudgee, and Wooloowin. When the great tide of immigration set in, about the year 1860, most of the immigrants went on to the land either as pioneer farmers or as farm labourers, the latter, almost to a man, becoming freehold farmers themselves. In 1861 the present thickly-settled district of Oxley, then known only as Canoe Creek, and Boyland's Pocket, attracted immigrants who received £40 land orders from the Government. Then the banks of the Brisbane River and of Oxley Creek were clothed with dense scrub, growing in a soil of surpassing richness. The settlers who took up these lands, for which only £1 per acre was paid, grew only corn and potatoes and some vegetables. The whole of the cultivation was done by hand, no horse or plough being employed. All produce was taken to Brisbane or Ipswich by boat, and it was no uncommon sight to see thirty or forty boats coming down with the tide laden with produce which was landed either at the wharf on the North Quay or at the ferry steps at South Brisbane. Yet the farmers throve well in those days. High prices for produce were the rule. Wages for farm labourers amounted to from 15s. to £1 a week and found. And what grand men these were! There was no such a thing as an eight-hour day. They felled and burned off scrub all day long, and many a time they knocked off for tea and then started to carry bags of corn and potatoes to the boat, which they pulled to Brisbane or Ipswich, returning with the next tide. These men and their descendants are to-day well-to-do. Are such sterling hard-working men to be found to-day, willing to undertake such work as the sturdy old immigrants undertook?

Yet the prospects for good men are the same to-day; and, indeed, far better than they were. In those days there were no goldfields offering attractions to a large nomad and settled population. The Canoona rush, near Rockhampton, had proved a disastrous failure, and to this may be attributed the lack of enterprise in the search for gold until the discovery of the Gympie Field gave a fresh impetus to mining research. In the meantime agriculture, in its most primitive form, and pastoral pursuits constituted the principal occupations of the sparse population, which, at the date mentioned, numbered less than 100,000 all told. The Far West and Far North were *terræ incognitæ*, but, as population increased, the people gradually extended their borders. The Darling Downs, which were persistently reported to be unsuitable for agriculture, developed by slow degrees until the tableland attained the celebrity which that magnificent portion of Queensland enjoys to-day as the grandest agricultural district of the State.

With the introduction of sugar, settlement in the North proceeded rapidly until the vast and fertile scrub lands from Brisbane to Cairns were cleared of their wealth of timber and placed under sugar-cane. From this period may be dated the rise and progress of the agricultural industry of the State.

The Darling Downs has ceased to be a purely squatting district. Station after station has been purchased by the Government from the original proprietors, the squatters, and cut up into farms, which have been sold on very easy terms to selectors, who have converted the vast sheep walks into

splendid farms. The long celebrated sheep station, Jimbour, near Dalby, is about to be acquired by the Government for closer settlement, and it will not be long before hundreds of persons will be settled there on the fertile plain country.

Of late the group system has been largely adopted, from twenty to thirty persons joining in taking up from 10,000 to 20,000 acres. Assistance is given to the farmers to build houses, erect fences, sink wells, procure stock, &c., and the repayment of the loans is made so easy that the instalments annually due are readily extracted from the soil in the shape of wheat, maize, barley, potatoes, and milk.

The demand for farming and grazing lands is ever increasing, not only within the State, but also in the neighbouring States, whence farmers are flocking in large numbers, attracted by the superior soil, climate, facilities for marketing, and, not least, by the cheapness of the land. Arrangements have been made for enabling intending emigrants from the old country to select their land before leaving Great Britain, so that, on arrival, they find a location all ready for them to settle on and set up their *lares* and *penates*. No undue or untrue representations are made to the emigrant. Every particular concerning the land and the prospects ahead are truthfully set before the selector. Consequently, when he arrives in Queensland, he finds that he is not exactly a stranger. All that he has learnt from official sources in the old country is borne out by the treatment he receives from the Lands and Agricultural Departments here. He discovers that he has been confirmed in his selection—that it is, in fact, his own property. He is conveyed to it free of expense, and knows that it only depends upon his own exertions to make a happy home for himself and to become an independent member of the community of the richest State of the Australian Commonwealth. Wherever he elects to settle, he finds himself in the midst of civilisation. There are schools for his children, churches of various denominations, schools of art and libraries, and halls of entertainment in the smallest and remotest townships. There are thousands of miles of railway, and hundreds of miles in process of construction. The dairy farmer finds markets for his milk and cream practically at his own door, for butter factories and creameries are everywhere in evidence.

One hears a great deal about the unemployed in Australia, but very few people pause to think who these unemployed are. They are not farm hands; they are not bushmen, such as stockmen, fencers, shearers, dam-makers, canecutters, &c. These can always find employment at good wages (as much as 30s. per week and found being paid to-day on the sugar plantations). Whilst as for female domestic servants there is a widespread demand for them. No female servant, willing to do good service, need remain a day out of employment in Queensland. The unemployed consist mainly of artisans, mechanics, and such as gain a good livelihood when the various trades are booming. But their ranks are unduly swelled by a class which abhors work, and will rather live on Government relief and private charity—so-called—than take steady work. There is plenty of well-paid work for good, honest men and women in this State, and the openings for such are daily increasing in consequence of the splendid seasons experienced of late years. The increase of the flocks and herds, the great expansion of the dairying industry, the opening up of the country by new railways, the establishment of new industries, the extension of the gold, tin, copper, and other mines, has opened a vast field for enterprise; and these all call for the immigration of good men from not only Great Britain and Ireland, but from other European countries. Germany and Denmark have sent us thousands of the best colonists the world can produce. They have taken up land, and have battled through all the initiatory difficulties of pioneering in the days when railways were not, when communication between the hinterland and the coast was difficult, yet to-day they, in common with their Teutonic brethren, the Anglo-Saxons, have put the world behind them and are in comfortable and, in many cases, affluent circumstances. To sum

up, no able-bodied, willing-to-work, sober, steady man accustomed to farm life in Europe need fear to cast his lot in Queensland. He finds here the most splendid fertile land in the world—hundreds of thousands of acres of it. He finds a climate under which he can produce all that is produced in any part of the temperate and tropical portions of the earth. Imagine for a moment, coffee growing alongside the British potato; the brave old oak producing its acorns alongside a tropical mango; sugar-cane and cabbages, wheat and oranges, all growing in the open under the same sun. Is there any other country under the sun where the same conditions occur? As for climate, from March to September there is no European climate which can equal it. On the coast frosts occur from June to August, as far north as Bundaberg, about latitude 25 degrees south. The thermometer in the Brisbane district often falls as low as 28 degrees Fahr. In the West, on the Darling Downs, from 15 to 16 degrees of frost are frequently registered, and still waterholes are covered with ice. Snow also has fallen at Toowoomba, the largest and wealthiest city of the plains. Yet, the orange thrives at Toowoomba as well as on the warmer coast lands. The hottest months are December, January, and February. There is, however, no day in the year when white men cannot work owing to the heat. Farmers work in the field throughout the year, and nowhere can a healthier or more robust man be found than the Queensland farmer or bushman.

ENSILAGE-MAKING.

The following paper was read by Mr. A. Dowling, of Talgai West, at a recent meeting of the Allora Farmers' Progress Association:—I feel somewhat diffident in addressing a practical body of farmers like yourselves on this important subject, as probably there are some of you who know more about the matter than I do; and it has been only at the urgent request of your secretary that I have come before you, in the hope that scraps of knowledge gained during my experience may be of some service to you in your endeavours to conserve fodder in the form of silage. The subject is a very interesting one, and there is none more worthy of the attention of our farmers, and more especially of our dairy farmers, than that of conserving in years of plenty sufficient fodder to tide them over the lean years that are sure to follow. By far the cheapest and best way to store fodder is in the form of silage, as, when cured in this way, it retains all the valuable constituents that in the process of converting it into hay are thrown off into the air, its digestibility thus being impaired. Manly Miles, a great American writer on ensilage, says:—"When green grass, or clover, approaching to maturity is first cut down it contains a considerable proportion of starch, sugar, and gum still unchanged into woody fibre, as it would mostly be were the plant allowed to become fully ripe. But when left to dry in the open air and under the influence of light, woody fibre continues to be formed until the plant becomes completely dry. The effect of this change will obviously be to render the dry hay less digestible on the whole, and consequently less valuable as food than the green grass from which it was prepared. Again, we know that by drying many very digestible and nourishing substances become less soluble, and consequently more difficult of digestion. The stomach of a growing animal cannot afford the time necessary to the complete digestion of such dry substances, and hence a large portion of the really nutritive matter of their food is rejected in the droppings of animals which are fed upon them." This is a self-evident fact that all of you must have observed in haymaking—that the stalk becomes hard and woody and less digestible than when in the green state; whereas when made into silage it more closely resembles the plant as growing in the field. We all know that dried fruits, although good and wholesome in their way, are less digestible and do not contain the luscious fruity flavours they had when growing on the tree. But put them whole in a bottle with their own juice, and exclude the air, and they retain the flavours of the original fruit for years. There is the

same one great fundamental principle to bear in mind in the making of silage as in the preservation of fruit by canning, and that is the exclusion of air. Every housewife knows that if she does not make her bottle of fruit airtight it will quickly spoil; and it is the same with ensilage—wherever the air can get at it, it goes bad. It stands to reason, therefore, that in making stack ensilage all the outside, which is necessarily exposed to the air, is waste; although even this the stock would pick over in a drought, and if sprinkled over with a little molasses it would help to keep them alive even if they did not thrive upon it. The least wasteful and most effectual way to conserve fodder is in an airtight silo, or pit, or a good excavation. I believe that with a properly constructed excavation in the ground one can make good ensilage more cheaply than in any other way, and I intend shortly to call for tenders for making an excavation on Talgai West to hold about 300 tons. But, of course, the airtight silo, or pit, or excavation all cost money, which the majority of our dairy farmers cannot afford, and my principal object in this paper is to encourage a regular system of ensilage-making amongst our dairy farmers that is at the same time fairly effectual and is less trouble and worry and expense than haymaking. I shall now endeavour to show you that good ensilage can be made in a stack without any artificial pressure, and that it is as simple and easy to make as hay is; in fact, if I had my choice, I would rather make ensilage than hay. Now, we will suppose we are about to make a stack of lucerne ensilage; first of all, select a suitable site on the highest piece of ground you can get in the paddock, because if your ensilage is making properly a large quantity of juice will drain away from it, and I have sometimes had to cut drains to let the juice away. Build the stacks round; I find there is more waste in square stacks on account of the corners, and round stacks are the easiest to build. The size of the stack must be determined by the quantity you are going to make. The larger the stack, the less the waste in proportion. Say you have a 50-ton stack to make; you will want to build it about 18 feet or 20 feet diameter, and as high as you like. A stack that is 20 feet high when finished off will not be more than half that in a few weeks' time, so great is the shrinkage. Be sure and keep the sides of the stack perfectly plumb, not slanting or bulging in the way a haystack is built; if you do not, the stuff is apt to slip when it heats, and your stack will be ruined; in fact, all through the process of making ensilage in stack you proceed on just the opposite lines to what you would in making hay. Cut the lucerne when the stalk is green and sappy, and before the flower comes on. If you let the stalk harden, it will not make such good ensilage. Start the mowing machine as early in the morning as you like, the more dew there is on the lucerne the better; in fact, I find that I always make the best ensilage in muggy, showery weather—just the time when it is impossible to make hay. Then let the rake follow the machine, and the dray follow the rake, and cart into the stack straight away. When you knock off at night, all you have cut during the day is safe in the stack; and you can go to bed happy, without worrying whether any rain in the morning is going to spoil all the hay you had so nicely cocked up the previous evening, ready for stacking. I never use a thermometer to test the temperature, or bother about the heat. I did all that sort of thing when I first started, and had such an array of ropes and levers for putting on the pressure that I was fairly staggered and disgusted with the bother and work; but all that is now done away with. Never be in a hurry to get your stack done too quickly, but let it settle down well. When the stack gets too high to pitch the stuff on to, knock off for a day or two, and it will settle down several feet; then pile it up again. If you have a large quantity to make, it is a good plan to have two stacks going on at the same time, building on them on alternate days. Keep the stack well trodden down as you go on, and let the inside be slightly lower than the outside; then if any slipping takes places it goes towards the centre. When the stack is completed, finish off the top dome shape, cover all over with 6 inches or 7 inches of earth, and let it rip. I have made several good stacks without any earth at all, but I prefer the earth, as it helps to keep the

air and rain out, and puts on more pressure. I use a mast and grab-hooks for lifting the stuff on to the stack when it gets high, but a staging will answer. The foregoing remarks apply to the making of lucerne silage; maize, of course, is much heavier stuff to handle, and the stacks are somewhat difficult to build, as it is such slippery stuff. I have made several stacks of maize, and they have always been successful; they have been square stacks, but if I make another it will be a round one. The maize stalks should all be cut and laid the same way in the field, and brought in that way, and put on the stack the same way, with the butt ends outward. Now, a few remarks as to the feeding value of silage. My experience is that it is not a fattening food; but it is *par excellence* a cow feed. You do not want to put fat on a dairy cow. I have not tried it with sheep, but I am of opinion that to those who are about to embark in lamb-raising it would be a valuable stand-by in a dry time to keep up the flow of milk in the ewes, and without which we cannot hope to rear good lambs. It is not supposed to take the place of green food when we have it; but how often there are times when the dairyman is suffering for want of green feed for his cows. Nearly every year there is some period of dryness, and then is the time when the ensilage stack or the silo proves its usefulness. To mention a case in point: You all know that last winter was the most severe we have had, barring the 1902 drought, since dairying was established as an industry here, and everywhere we heard of people turning their cows out; and yet at Talgai West we kept up the flow of milk all the dry time, with the help of ensilage, to considerably over a gallon a cow average. Manly Miles again says:—"Lucerne silage is superior to lucerne hay on account of its succulence, as well as its higher feeding value."

The last-mentioned point is mainly due to the fact that all the parts of the clover or lucerne plant are preserved in the silo with a small, unavoidable loss in fermentation; while in haymaking leaves and the finer parts, which contain about two-thirds of the protein compounds, are easily lost by abrasion. Now, this is very self-evident. We all know that one of the greatest difficulties to contend against when making lucerne hay is to preserve the leaf and keep it from falling off; and that the leaf is the most valuable part of it. In making it into silage, all is saved; and that is where it comes in that there is six times the feeding in silage that there is in hay; as the writer quoted above says, the leaves contain about two-thirds of the protein compounds. This protein is one of the principal constituents that promotes the formation of milk; and, therefore, you want to use a food for milch cows that contains a large amount of protein. In conclusion, I may state that there are all sorts of ways of making silage, but I have endeavoured in the above remarks to exemplify to you the simplest form in the stack, and to show you that a man should not be debarred from making silage because he has not got a silo and cannot afford to put one up, for I trust I have proved that the best of silage can be made without one, and that it need not cost any more in its manufacture than hay.

In replying to questions, Mr. Dowling said that if the ground was suitable it was best to build the stack on the ground; the presence of logs or stones under the stack tended to let in the air. In making maize silage, his experience was that it was best to cut the maize when it was in the milky or flag stage. He had the maize cut down with cane knives, and four men accustomed to cane-cutting would cut down enough to keep two lorries drawing away. In making use of a pit for ensilage, it would be as well to make provision for draining the juice away. In stack silage there was a certain amount of waste to take into consideration, but everyone had the means of making a pit, and silage could be conserved as cheaply that way as any way. There was no doubt about its value, and anyone engaged in the dairying industry, and having the welfare of his cows at heart, should endeavour to make silage. Cows at first might not like it, but they soon get used to it, and would then run after it. Last year he thought he had made about 460 tons; but this was a mere fleabite to what he should like to make.

MUSHROOM-GROWING.

Mushrooms are so easily grown that anyone possessing a cellar, shed, or outhouse, with a temperature of from 48 to 55 degrees of heat, has just the convenience for their growth, and can obtain a supply all the year round. Obtain as much short manure, straw, and droppings from draught or other horses fed on hard corn, &c., in about equal proportions—droppings from horses that are fed on carrots, or where horse powders are frequently given, should on no account be used, as the result would be failure—(fresh from the stable, if to be had, but that is not absolutely necessary) as will make a bed 16 to 18 inches deep, and any required size; throw the same in a heap for a week to heat, and dispel the greater part of the moisture it contains, then spread it out for a day or two to dry and cool down, after which again throw it up together for a few days—generally about five will be found sufficient. It will then be fit to make the bed with, which, let the size be what it may, should not be more than 18 inches deep. When making up the beds a tenth part of nearly dry cow manure, if procurable, should be well mixed with it, as this has a tendency to keep the beds longer in bearing, and, besides, gives the mushrooms a much thicker and firmer flesh.

In making the bed, it should be trodden or beaten down as firmly as possible, that the heat may be the more lasting, and not so liable to rise too high at first. As soon as the heat has risen and declined to 70 degrees, it is fit to spawn. Amateurs will do well to observe this, as too high a degree of heat destroys the vitality of the spawn, while a lower temperature is not sufficient to produce the vigour necessary for an abundant crop. It should be broken in pieces about the size of a walnut, and placed in the manure 2 inches deep and about 6 to 8 inches apart every way. Then cover the surface of the bed 1½ inches with a layer of loam (if possible) or good garden soil, and make it firm, and afterwards well pat with the back of a smooth spade dipped in water, the same day the bed is spawned.

In a cellar or outhouse in which an even temperature of 55 degrees can be secured, no covering or litter or any other material will be required; but, in cases where this convenience is not at command, litter must be used to effect the desired temperature, and will keep the surface of the bed in a state of moisture.

The mushrooms begin to appear in about four to six weeks after the bed is spawned, after the temperature above mentioned is maintained. Should the beds become very dry, they must be watered, but not saturated. The water should be lukewarm, and applied through a fine rose, and should never be given in great abundance. But mushrooms like a moist, fixed temperature, which may be produced by occasionally syringing the walls, floors, &c., wherein the beds are made. Avoid cold draughts and chills, which often cause the embryo mushrooms to damp off.

When gathering the crop, do not cut the mushrooms with a knife, but take them out by the root; this may be done by a twist of the thumb and finger, afterwards filling in the space made with a little loam.—"Hackett's Manual."

SORGHUM POISON.

Mr. J. C. Brünnich, Agricultural Chemist, referring to a paragraph in the "Daily Mail" in connection with sorghum, said:—

"As soon as the crop gets older, the amount of poisonous glucoside becomes less and less, and at the time when the seeds begin to form the amount of poison has become so small that the fodder is perfectly harmless. It is very rare that ill effects are caused when feeding stock with sorghum chaff, as generally fairly mature sorghum is cut for chaffing, but a great number of deaths have been caused when cattle got accidentally into a field of young sorghum, and in some cases cows and bulls were killed suddenly after a few minutes' grazing, the symptoms being quite different from the effects of hoven.

Drying the fodder will not destroy the poisonous substance, but any fermentation will, and it is very probable that sorghum made into ensilage will be quite free from poison, but experiments in this direction are being made at present by our department.

"Should at any time a beast show ill effects after feeding on sorghum, a good drink of sweet milk or, again, molasses diluted with water should immediately be given (see Annual Report of the Department of Agriculture and Stock for 1905-6, or this July number of 'Agricultural Journal,' page 19). There is no difference in the poisonous qualities of young sorghum if first, second, or later cuts, but sorghum of a very rank growth, grown on very fertile or heavily manured land, is generally more dangerous.

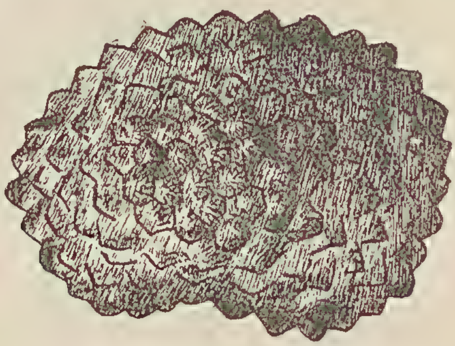
"All the varieties of sorghum contain the poisonous glucoside in varying amounts, and also other allied fodders, like maize, panicum, millet, Kafir corn, Mazzagua, and also canary grass *(Phalaris commutata)*, and all such fodders have to be used with caution when in a young immature stage of growth.

"It will also not be out of place to again warn farmers that sweet potato vines contain likewise considerable amounts of a similar poisonous glucoside, and a large number of sudden deaths in piggeries must be attributed to this cause. A very large number of plants contain such prussic acid yielding glucosides, which bodies, as the name implies, are related to the sugars (glucoses), and yield sugar when they split up. It is very probable that these chemical compounds are an intermediate product in the assimilation of nitrogen for the formation of the valuable flesh-forming proteins or albuminoids, and at the same time their poisonous properties protect the young plants in their earliest stages of growth."

MUSHROOMS OR TRUFFLES?

By D. O'CONNOR, Oxley.

The astonishing and highly interesting discovery of so-called "mushrooms" in a corner of Albert Park, near Melbourne, gives Australia another and a valuable asset. A mistake has been made in calling them "mushrooms"; they are evidently a fungus of far greater value—viz., truffles—which Mr. Robert Thompson, in "The Gardener's Assistant," says are worth in England from 15s. to 20s. a lb. The chief difference between the mushroom and the truffle



TRUFFLE *(Tuber æstivum).*

is that the former is produced above and the latter below the surface of the ground. The truffle discovered in Melbourne appears to be of a different variety from those of Europe, the latter being found only at the roots of trees,

chiefly the oak and beech, whereas the former are produced in the open and quite away from trees; they are also found only on made ground formed of the sweepings of the streets. In gathering truffles, the European truffle-hunter could do nothing without the aid of a well-trained dog in England, or an equally well-trained pig in France. These animals scent the tuber from a little distance, and run off to the spot where the truffle lies buried, and proceed to unearth the precious morsel, which they would eagerly devour, but the hunter drives the animal off, and by digging soon unearths the coveted prize. The Victorian species is harvested without the assistance of any of the lower animals; it is only necessary "to stoop to conquer." The harvesters, consisting of men, women, and children, are shown in a photograph down on their hands and knees searching for slight cracks in the ground, beneath which the tuber is found. In this manner, the "Australasian" states, that tons must have been gathered. The Australian truffle surpasses the European variety in that a ton of truffles has a value from £1,680 to £2,240! A great many people passed over Mount Morgan before its wealth was recognised. It is to be regretted that the "Australasian" did not give a figure of the tuber or a portrait of its discoverer—perhaps it is not now too late? The only thing I have yet seen in Queensland resembling a truffle was shown me by our eminent botanist, Mr. F. M. Bailey. It has more the appearance of a geological than a botanical specimen; it is like a truffle in colour, and similar in shape and surface, but it transcends it in size, as Jupiter does Mercury. Mr. Bailey's curiosity weighs 8½ lb., and measures in length 8½ inches, in breadth 7 inches, and in circumference 22½ inches; it is named *Polaporus mylittae.* Mr. Henry Tryon, Government Entomologist, showed me a specimen, and he also was good enough to gratify my curiosity by ascertaining its weight and dimensions, which were—Weight, 5½ lb.; length, 8 inches; breadth, 6¾ inches, and circumference, 22¼ inches. This tuber [Fungus?—Ed.] is known in some districts as native or blackfellow's bread, of which the aboriginals are said to be very fond. Mushrooms, of which there are numerous varieties in Queensland, have been strangely neglected. I know of only two persons who have eaten more than one kind (*Agaricus campestris*). This species is more widely distributed

Common Mushroom *(Agaricus campestris).*

throughout the world than any other, but it is by no means the best. The late Dr. Joseph Bancroft and I one day collected fourteen varieties, which we tested in the evening. We rejected only two, mainly on account of their powerful and unpleasant odour; the others were approved, though they were not equally good. Two kinds we thought were better than *campestris*. Our

collection contained two *boleti*, both of which were excellent; the rest were agarics.

BOLETUS.

Those who desire to know more of the discovery above referred to will find an interesting description, together with eight illustrations, in the "Australasian" of 25th May.

WEST INDIAN COTTON.

Prices for West Indian Sea Island cottons continue to be very high, a fact which should induce those of our farmers who have suitable land on the coast to plant this class of cotton largely. Messrs. Wolstenholme and Holland, Liverpool cotton brokers, wrote as follows, under date 8th April, in respect of sales of West Indian Sea Island cotton:—

West Indian Sea Island cottons have been in good demand during the past fortnight, both for home and foreign spinners, and prices are very steady.

The sales reach about 400 bales, and comprise: Barbados, 24d. to 25d.; Montserrat, 22d. to 24d.; Nevis, 21d. to 24d. (the latter being the best we have seen from this island); Antigua, 24d. to 29d.; Anguilla, 19d. to 23d.; and St. Vincent, 21d. to 29d.

Spinners hold fair stocks, and, of course, are indisposed to carry into next season any of this high-priced cotton. We are, therefore, in favour of as prompt sales as possible at anything like these figures. The demand runs from 22d. to 24d., and to obtain above the latter figure the cotton must be superfine, in which case spinners are indifferent about price, as the quantity of such cotton to be obtained is so small.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 30TH JUNE, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Sue* ...	Ayrshire-Sh'th'rn	22 April, 1907	895	4·4	46·07	
Pee-wee* ...	Holstein-Sh'rth'rn	6 April ,,	838	4·0	39·21	
Night ...	Holstein-Devon	29 May ,,	767	4·0	35·89	
Hettie* ...	Ayrshire-Sh'th'rn	27 April ,,	640	4·6	34·44	
Chocolate* ...	Shorthorn ...	5 Mar. ,,	735	3·8	32·68	
Laura ...	Ayrshire ...	20 May ,,	755	3·6	31·80	
Poppie* ...	Guernsey-Jersey	24 Feb. ,,	620	4·4	31·91	
Rhoda* ...	Grade-Shorthorn	12 Mar. ,,	661	4·0	30·93	
Blank* ...	Jersey-Ayrshire	4 Feb. ,,	556	4·5	29·27	
Lowla* ...	Ayrshire ...	25 Mar. ,,	654	3·6	27·54	
Nettle ...	Shorthorn ...	17 May ,,	653	3·6	27·50	
Renown* ...	Ayrshire ...	27 Mar. ,,	608	3·8	27·03	
Lass ...	,, ...	19 April ,,	598	3·8	26·58	
Bonnie ...	,, ...	21 May ,,	597	3·8	26·54	
Dewdrop* ...	Holstein ...	24 Mar. ,,	571	3·6	24·05	First calf.
Maggie ...	,, ...	12 May ,,	536	3·6	22·57	First calf.
Kit ...	Shorthorn ...	6 May ,,	532	3·6	22·40	
Donah ...	Holstein ...	30 May ,,	506	3·8	22·49	
Dripping ...	Holstein-Sh'rth'rn	28 Nov., 1906	412	4·5	21·69	
Winnie ...	Shorthorn ...	11 Sept. ,,	376	4·6	20·23	

NOTE.—During this month all milking cows were given a ration of lucerne chaff well mixed with molasses, 60 lb. to each cow.

Cows marked thus * were allowed to graze on lucerne two hours daily, after the morning's milking.

SWINE FEVER—ITS CAUSES AND EFFECTS.

Swine fever, swine plague, or swine pox is a disease of pigs much like typhoid fever in the human being. Its symptoms are many and varied, but the following are as near as can be given:—Outwardly the pig is dull and loses his appetite, but has a great thirst, and will drink anything he can get. He has a heavy look about his eyes, as though he had a pair of spectacles on, and stands with his back up, and has a most dejected appearance. He gives a short barking cough when disturbed, and will not move unless he be made to. In a day or two he breaks out into a reddish, purple rash, which passes down the front portion of his body; the ears and across the shoulders, down the inside of the hind legs, and along the belly, are of a dark purple. The dung is hard, and has a peculiar nasty, sickly smell. He refuses all solid food, but still drinks a lot, and huddles in one corner as though afraid of the light or cold. If made to move, he does so with difficulty, and may have shivering fits; diarrhœa sets in, and the end is near. One-ounce doses of sweet spirits of nitre in warm gruel or linseed tea will relieve it during the first day or two. Small doses of castor oil or salts will relieve the bowels, and a tablespoonful of sulphur every day in the gruel will help the afflicted animal for the first few days, but no solid food must be given, only light sloppy food easily digested. Try to keep the bowels open, and the body as warm as possible. Injections of soap and water may be used, and scrupulous cleanliness should be observed.

PREVENTION OF SWINE FEVER.

As the result of very exhaustive experiments made by the United States Bureau of Animal Industry, with the object of discovering some effective cure for swine fever, the following mixture has been recommended as a useful preventive and a probable cure:—

1 lb. wood charcoal, 1 lb. sulphur, 2 lb. sodium chloride (salt), 2 lb. sodium bicarbonate, 2 lb. sodium hyposulphite, 1 lb. sodium sulphate, and 1 lb. antimony sulphide. A dose of these ingredients, which should be thoroughly mixed, is one large teaspoonful per 200 lb. live weight in a pig, once a day. It may be given in soft food if the pig is not too ill to eat, or otherwise as a drench.

THE COW AND COTTON.

The "Florida Agriculturist" has the following from the "Southern Ruralist" on the connection between dairying and cotton-growing, particularly in respect of "A Home-made Fertiliser for Cotton":—

"That there is a natural relation between these two products is so apparent as to be a truism. The real importance of this relation is not so generally recognised.

"A few of these natural relations may, therefore, be properly urged for consideration.

"Every one of our special dairy articles mentioning the matter of feed stuffs mentions the use of cotton seed, cotton-seed meal, or cotton-seed hulls. This is not solely because these are home products and convenient to use. Every modern table of dairy rations includes cotton-seed meal. It is shipped to the great dairy sections of the North by the trainload. There is more of the meal fed in New York or Wisconsin than in any cotton-growing State.

"The rapid increase in the price of the meal during the past five years has been astonishing. The reason is not to be found in the increase in cost of fertilisers, because cotton-seed meal has advanced relatively much more rapidly than other fertilising materials. The real reason is the great increase in the cost of all feed stuffs. Cotton-seed meal has more than kept pace with the advance of other feeds.

"Cotton-seed meal is fed to dairy cows almost universally, not because it is convenient, certainly not because it is cheap. It is fed because the principles and experience of rational, scientific, economical feeding show it to be, in many cases and combinations, the best protein cow-feed.

"There is here, therefore, a very distinct and important relation between cow and cotton.

"If there was any logical reason why cotton mills should come South—move nearer the cotton fields—the same reason dictates that the cow—the butter factory—should come nearer and develop close to the cotton fields.

"The success—profits—of any industry depends first on the cost of production.

"The cow is a machine. She is the milk and butter machine of the dairy farm, which is a true factory. Cotton products are only a part of the raw materials used by this machine in making milk and butter. Grass, hay, root crops, ensilage, and pasturage are indispensable. All are produced more cheaply where cotton grows than in any other section of our country.

"Land and labour must be used. Both are cheaper in the South than in the sections where the dairy industry is older and more highly developed.

"Climate, which so materially influences many manufacturing processes, has been continually urged as a disadvantage to the Southern dairyman. As a matter of fact, this is really one of his greatest advantages. The long, warm summer, if possibly a slight hindrance, is far more than balanced by the mild winter, with no waste of food for maintaining animal heat, and green pasturage through the entire season.

"Next to supply of raw material and cost of production, regular and convenient markets are most important in controlling the success of any manufacturing business.

"Go into any town or cross-roads store in the South, and you will find tub butter shipped from the North always on hand, and sold at from 25 cents to 35 cents per lb.

"Here is the market, at our door, right close to the cotton fields. This must continue to exist just so long as the people who make and handle the great staple are consumers and not producers of dairy products.

"Then, while the cow is making butter, milk, and money, she is restoring and maintaining the fertility of the land—making more cotton.

"Can anyone doubt the intimate relation—the profit to be made—by combination of cow and cotton?"

We have emphasised the last two paragraphs, as we intend to use them as a text for the few remarks we propose to make as an addition and supplementary to this most excellent editorial.

Cotton-seed meal is found on analysis to contain a larger amount of nitrogen than the cereals.

Now, when the farmer raises cotton, he must necessarily impoverish his land more than he does by planting corn or wheat. Therefore, he finds it necessary to fertilise heavily. This is generally done (or was formerly) by means of commercial fertilisers.

This item of expense was a great drain on the financial returns for a crop. It is true that the price obtained for the seed offsets this somewhat. However, our experiment stations are, through their bulletins, gradually instructing cotton-growers in a better way. Let me contribute my mite to this education.

First.—The cotton fibre is almost pure carbon, which is obtained mainly from the atmosphere; therefore it does not impoverish the ground to raise it.

Second.—The oil is an hydrocarbon, consisting of the elements of water and carbon; therefore its sale from the land does not impoverish it.

Were a farmer to take a wornout old field and plant cotton on it for several years, selling the fibre and oil from the small crop raised, and returning the meal and residue of the plants grown back to the soil, his land would progressively become richer each year without his adding any other fertiliser to it.

Third.—Or, better still, if he keep stock, feed the meal to them, and use their excrement for fertiliser, he will enrich his ground still more.

The fat, or butter, is almost identical in composition with cotton-seed oil. The skim-milk can be fed to hogs or chickens. The bulk of the weight of the hog is fat, another hydrocarbon; therefore selling him takes little or no fertility from the ground. The excrement voided by the hogs will be found, if analysed, to contain as much, if not more, fertilising material than his sold carcass. If butter dairying does not pay in Florida (of which there is some doubt), there is an ever-increasing demand for sweet cream, which can be shipped many hundred miles.

THE BEST PIG.

The breeding of pigs has for many years been very much improved by our farmers, aided by experts—private and official. It would be difficult to-day to find many examples of the old-fashioned, long-snouted, razor-backed pig, which was frequently the only animal owned by the early farmers. Then came the era of China-Polands, Prince Consorts, and other small whites and blacks, and, lastly, we arrived at the Improved Berkshire, the Tamworth, and the Essex period. Now, it is a remarkable thing, and one which is ably discussed in the "Farmer and Stockbreeder," in the genus pig, that the smallest and neatest races make the worst bacon, or, to put it in a milder form, to save hurting the feelings of those men who farm the smallest sorts, do not make averagely good bacon. Even the immense Large Whites, the Large Blacks, or the big Tam-

worths, give better bacon than the Small Whites and Small Blacks. In all other animals, such as cattle and sheep, we judge in a great measure of their quality by their size, yet we appraise them the other way about—primest quality goes with the smaller, and *vice versâ.*

Take, for instance, big Shorthorns or South Devon oxen. Their quality of beef does not nearly equal that of the little tight North Devons—the Rubies of fame—the Welsh runts of the Principality, the Aberdeen-Angus, that come from across the Border, or the Scotch Highlanders, the best of all.

In the eyes of too many breeders a pig is a pig so long as it be sizeable. They breed with no idea that quality goes for half as much as it really does. Nor did it in the old days so very much count. The bigger the hog the more he was reckoned of, and the thicker the flitch in fat at that was reckoned the best. But it is very different nowadays. Our bacon merchants have too much of the world to select their flitches from. So it is oft-times a case of the best quality in demand and the rest nowhere.

But, what is quality? As far as a bacon-pig goes, it is plenty of lean to the fat—lean of fine grain or fibre, and fat rich, as fat ought to be. There should be, too, a thin rind, fineness of bone, and all parts well developed where the best meat obtains. As a rule, fine hair or bristles not too bristly denote to a great extent good quality of meat in the live hog. It goes without saying there must be proper rearing, fattening, and well-judged age to give the prime meat, as well as the right breeding; but as regards the latter, in every quarter there has been such improvement made within the last three decades that has left it comparatively easy to establish satisfactory results in such regard. The same applies to both crosses and pure-breds, and oftentimes a blending of blood makes an improvement in the progeny all round—in size, quality, constitution, and prolificacy.

THE GOVERNMENT MERINO FLOCK.

Presented by Mr. W. B. SLADE, of Glengallan.

The flock has been established on 50 selected stud ewes from the Glengallan flock.

The Glengallan flock was established in 1855, by the late Mr. John Deuchar, on pure Spanish merino blood, and has been maintained, unalloyed, on that blood ever since. In 1828, a number of Saxon merino sheep were selected for the late Mr. I. Brindley Bettington, of Brindley Park, Merriwa, New South Wales, and brought to Australia by the late Mr. Frederic Bracker in 1829. A draft of their direct descendants was purchased by the North British Australasian Company, and placed on their Rosenthal Run, near Warwick. From the increase of that flock the late Mr. Deuchar, in 1855, selected 100 ewes. These were by a pure imported Saxon merino ram, purchased in Sydney by the late Mr. John Gammie, of Talgai. Mr. Deuchar secured a son of that ram from one of the Brindley Park ewes, which developed into one of the best rams on Darling Downs, and was long and widely known under the familiar name of "Billy." He proved unapproachable at every show at which he entered an appearance. He was described by those who had seen him as a fine deep-set sheep, with superb aristocratic head, and covered with a faultless fleece of remarkable evenness and quality. "Billy" was coupled in 1855 with the 100 ewes above mentioned, and thus was laid the foundation of the Glengallan flock. Subsequently, when in Europe, Mr. Deuchar personally selected 10 rams and 10 ewes from the flock of Baron von Maltzhan, in Mecklenburg, and these arrived at Glengallan on the anniversary of Her late Majesty's birthday in 1860. Baron Maltzahn's flock was directly descended from a Spanish royal flock. These imported ewes were mated with "Billy," and the rams with his progeny. The late Mr. C. H. Marshall, senior partner of the firm of Marshall and Deuchar, made a further importation, in 1862, of 10 rams and 15 ewes from the same flock and of precisely the same blood as the previous importation.

Since the last-named year—1862—the flock has been bred entirely within its own blood. The matured judgment of Mr. Deuchar was universally acknowledged, and to his judicious formation and personal close attention may be attributed the fixed type of the Glengallan stud flock, and which has been successfully preserved by Mr. W. B. Slade since he acquired the direction of it in 1872. The almost unprecedented showyard successes of the flock and its triumphs at competitive wool shows are widely known. It may be mentioned that the Government flock are the progeny of a ram the weight of whose fleece was 21 lb., and on being scoured at the Brisbane Technical College gave a weight of 9·93 lb. of absolutely clean wool, in a fit state for the manufacturer, which is seldom the case with ordinarily scoured wool. The sire of the 35 lambs now tailed is the pure Glengallan sire, born in 1900, OGAO on off horn, and yielded in 1904 23 lb. of wool, and in 1905 20 lb. of wool of eleven months' growth. This sire is the father of the best sire now on Glangallan.

MARYBOROUGH POULTRY SHOW.

More genuine interest in poultry-breeding as an industry appears to be taken in Maryborough than in many other parts of the State. This was shown by the large number of entries and the excellence of the birds at the third annual show of the Maryborough Poultry Club, which opened on 12th July. There were about 500 birds exhibited by breeders from Brisbane, Rockhampton, Bundaberg, and Gympie, in addition to Maryborough exhibitors. Mr. H. L. Jones, of Goodna, was the most successful winner of special prizes, and his black Orpington cock was awarded the champion prize. There was a very large attendance at the show. The special representative of the Brisbane "Courier," in concluding his report, said—

The third annual show of the Maryborough Poultry Club, which was concluded on Saturday, proved a marked success in all branches. The exhibits numbered 470, and included birds equal to any in the Commonwealth. Especially was this the case in Orpingtons, Wyandottes, and Leghorns. A black Orpington cock belonging to Mr. H. L. Jones, of Goodna, won the championship of the show, and gained the gold medal (donated by Mr. H. Bashford). A silver-laced Wyandotte pullet, the property of Mr. H. Bawden, Rockhampton, won the prize for the best bird of the opposite sex to the champion, securing the silver medal (also donated by Mr. H. Bashford). The club's two previous shows resulted in a good cash credit balance, and this show has proved much better financially in proportion—a direct result of the efforts of the hard-working and enthusiastic executive. For the drawing held in connection with the show the following were the donors of the prizes:—Messrs. Paul O'Neill (trio of Black Orpingtons), A. C. Potter (two Black Orpington pullets), H. Simpson (trio of White Leghorns), Job Roy (trio of Silver Wyandottes), Hills and Gitsham (trio of Golden Wyandottes), K. D. Moore (White Wyandotte cock), C. Watson (trio of White Wyandotte pullets), W. McDonald (one Silver Wyandotte cockerel), A. Shillig (two Silver Wyandotte pullets), W. Goff (pair of Black Orpingtons), H. Nelmes (one Black Orpington pullet), J. Rawlings (pair of White Leghorns), W. R. Mitchell (pair of White Leghorns), O. C. Kinne (Golden Wyandotte cockerel), and J. Goodall (setting of eggs). As a result of a telegraphic error the report of awards in Saturday's issue was made to read that Mr. E. R. Hughes was the winner of the "Eclipse" Challenge Cups, value £3 3s. each, for champion Orpington and champion Wyandotte in the show, whereas he was the donor, the names of the exhibitors preceding his name being those of the winners in each instance. These cups have to be won twice by the same exhibitor. They were first competed for in 1906, and were won respectively by Mr. A. C. Potter (Gympie), Orpingtons, and Messrs. Gibson and Kennedy, Wyandottes. The President's Cup, value £3 3s., donated by Mr. F. T. Lukin, for the exhibitor winning the greatest number of prizes, was won by Mr. H. L. Jones, of Goodna, who secured 75 points. Mr. A. C. Potter (Gympie) was second, with 66 points.

The Horse.

THE HORSE'S FOOT.

The importance of properly shoeing horses was shown in the essay on horseshoeing from a New Zealand journal, which we published last month. So much suffering can be inflicted on horses by ignorance or want of care in treating the horse's foot that we advise a careful perusal of the following remarks on the subject in a leaflet issued by the Royal Society for the Prevention of Cruelty to Animals:—

To most persons, the foot of the horse appears to be only a roundish, hard lump of horn, on which an iron shoe is nailed to prevent its being worn away by the roads. Such persons may perhaps hear with astonishment that it is a complete and elaborate instrument, perfectly adapted to the work it is intended to perform, and that our artificial assistance, far from preserving, often cripples and very frequently totally ruins it.

The real foot of the horse is enclosed in a horny case called the hoof, and the outside rim of this casing forms what is called the crust or wall. The fore part is about ½-inch thick, becoming thinner towards the back. It extends round towards the heel, and then curves sharply inwards.

The ends which incline inwards are called the bars. In the natural state of the hoof they are quite prominent and visible; but in a horse which has been frequently shod they are often nearly obliterated, as, frequently, the farrier, by a mistaken and faulty system, cuts them almost entirely away. The mischievous effects of this practice will be seen when we come to consider the uses of the hoof. In the middle and hinder part of the foot is an elastic, horny substance, called the frog, which occupies about a quarter of the sole. It forms a soft and yielding cushion on which the horse's foot partly rests, being thus relieved from the shock of the hard hoof on the ground. This important part is, in too many instances, pared away by the ignorant and prejudiced farrier, who follows what he has been taught by those as unskilful as himself.

The part of the foot which has a plane surface which is opposed to the ground, and extends from the frog to the outside or wall of the hoof, is called the sole. It is horny and hard, yet not solid, but somewhat elastic.

In the hinder part of the foot, where the two ends of the frog terminate, are the heels; and these also are of the same horny character. To attempt a full description of the internal structure of the foot would be beyond our limits.

Immediately inside the hoof, in the fore part and sides, is the bone of the foot, properly so called, or the coffin bone, as it is termed. It fills the fore part of the hoof, and is of a light and spongy formation, being filled with numerous blood vessels, through which the circulation of this extreme part of the body is carried on, without any danger of their stoppage by means of the pressure to which they are continually subjected; the substance of the bone not only allowing the blood vessels to pass freely through, but protecting them from every obstruction. Around this bone are a great number of elastic, prominent ridges of a membranous nature, which fit exactly between similar leaves or ridges on the inner part of the hoof. The end for which they are so placed is to modify and soften the shock to which the horse's foot is naturally subjected on passing over the rough ground he has constantly to traverse, and also to attach the hoof to the bone. At its summit, in front, is fixed the larger extensor tendon of the foot.

Fitting into this bone, at the top, is another, called the small pastern bone, to which is joined another strong tendon, that regulates the use of the foot. On its upper surface it forms a cube-like hollow, and receives the end of the large pastern bone; while below and behind is a small, moveable piece, named the navicular bone, which seems to have for its object the steadying and strengthening the action of the powerful flexor tendon that is inserted into the sole of the coffin-bone.

If the foot were a flat and unyielding mass, the danger of slipping would be, in many instances, very great. But, instead of this, it has a prominent edge all round, which takes a firm hold of the ground and obviates the difficulty. Further, this hoof is somewhat elastic, and, on the weight of the horse being fully thrown on it, allows the inner soft cushion or frog to descend and press firmly and tightly on the earth. Thus, two ends are wonderfully and completely attained: firmness in the tread, ensuring the horse's safety, and a regularity of pressure which obviates the jarring that would be so painful and prejudicial.

When the animal is in a state of nature, its hoof is strong enough to need no artificial protection; but on the hard and stony roads common in all civilised countries it has been found necessary to fit something to the foot to protect it from the great wear and tear which is unavoidably incurred. For this purpose nothing has been found so effectual as what is termed shoeing, or affixing a thin plate of iron round the outer hard and horny edge of the hoof—a practice known in Britain during the time of the Romans. When done with judgment, the proper action of the foot goes on nearly as usual; but, if injudiciously performed, the action of the horse is impeded, lameness is caused, and temporary or permanent diseases are brought on. The smaller the shoe the better, as a rule.

Many persons, from an idea of saving time, desire the smith to come and shoe their horses, instead of sending them to the forge. This should never be done. For when the workman is by his fire, if the shoe should not quite fit (as is nearly certain to be the case), he can easily heat and alter it; but if at a distance, in the farmer's or gentleman's stable, he has not the opportunity of doing so, and can only make foot and shoe match by cutting away the wall of the hoof—a most dangerous practice.

To those who consider the matter, it must be obvious that this tender and important organ ought not to be left to the care of an ignorant and too often brutal smith without supervision. His trade requires judgment and discretion; and there are no better means of ensuring careful shoeing than for the horse proprietor to visit the forge while the horse is being shod and observe the proceedings. More depends on the preparation of the foot than on the affixing of the shoe; for the latter will hardly do much damage, unless made outrageously bad or nailed on in a most clumsy manner; but it should be constantly kept in mind that a horse may be easily lamed from rash and ignorant paring of the hoofs. Indeed, the great evils of shoeing are cutting the sole and frog, putting on too heavy or too small shoes, and rasping the outer surface of the wall of the hoof. Sometimes, also, the shoes are allowed to remain on the feet for too long a period. They ought to be regularly attended to at intervals of about three or four weeks, and no misplaced ideas of economy should allow a longer period to elapse without an inspection of the feet.

BRITISH VIEW OF HORSE-BREEDING IN QUEENSLAND.

The question of improving the existing types of horses is just now affecting the agriculturists of Queensland. But we learn that the establishment of State horse-breeding farms, or the payment of large premiums to horse-owners, whatever may be their respective merits, are neither likely to be brought into practical operation in Queensland for many years to come. Horse-breeding is a natural industry of that State, and requires judicious control, and not the artificial stimulus of European countries to obtain a great improvement on the present. The stallion is the source of greatest trouble there, for, while racing has done much to improve the breed of horses, the excessive growth of the betting element in the sport has overshadowed the more important aspect of producing animals of strength, substance, and stamina. It has brought about a class of weedy sprinters which can neither carry weight nor travel any dis-

tance. To eliminate this class of animal, it should be enacted that no stallion should be allowed to stand for stud duty unless licensed to do so; and to obtain that license the animal should have to secure the approval of a Government veterinary surgeon both as to his stamina and freedom from transmissible disease. New Zealand has gone so far as to purchase suitable stallions of its own which are available to farmers' mares at a moderate cost; and Victoria is now actively discussing the question of control of the horse-breeding industry.—"Live Stock Journal."

POINTS OF THE DRAUGHT HORSE.

In his recent bulletin on "The Principles and Practice of Horse-breeding," the noted American authority, Dr. A. S. Alexander, of the University of Wisconsin, explains as follows some of the points and characteristics of the typical draught horse:—

Height.—A typical draught horse should stand sixteen hands high, or somewhat over that height. Extra tall, leggy draughters, deficient in weight, width, and quality, are unliked in the market, and many of them are prone to chorea (St. Vitus' dance). Abnormally tall horses, unless wonderfully good in conformation, so that the height is not ungainly, are difficult to match, and, therefore, not in demand in the market. Such horses are used for single work, or as the middle horse of a three-horse team for hauling coal, &c.

Weight.—A draught horse should weigh 1,600 lb. and upwards. Weight is absolutely necessary for the hauling of heavy loads. It enables the horse to derive full benefit from the strength of his muscles and tendons, adds to the effect of his levers in motion, and gives him a firm grip upon the ground. It is a burden, and practically useless, when not associated with perfectly developed, exercised muscles, so far as actual work is concerned, but is requisite in every draught horse offered upon the market if he is to command a high price. Where the frame shows adaptability in a thin horse to put on flesh, he is bought by the professional feeder, who finishes him for the market. In a well-developed draught horse extra condition is considered worth 25 cents per pound in the Chicago market. For practical purposes the great weight of a draught horse should be made up of large, strong bones, and powerful muscles throughout the frame. Fat should be discounted in buying a draught horse for work, and, in judging, one should note development of muscle rather than wealth of flesh and fat. A typical draught horse should still weigh 1,600 lb. or over when deprived of the condition referred to.

Form.—The entire make-up of the draught horse should suggest strength for heavy hauling. He should be broad, deep, thick, round, with each part in keeping with its neighbouring parts, giving an appearance of symmetry and massiveness. He should be low-down, blocky, and compact, on short, strong-boned, clean legs, showing marked prominence and development of tendons, and the legs should be properly placed and set to ensure correct, straight action at the walk or trot.

Quality.—This term applies to evident refinement in character of skin, muscles, bone, tendons, and hair. It infers, also, aristocratic breeding, and all the attributes of pure blood. It is indicated by high spirits, vigour, sprightly action, endurance, stamina, and intelligence, and is plainly indicated when the legs are free from meatiness, appear broad, flat, "clefty," and, if furnished with "feather," the hair under knees and hocks springs as a silky fringe from the rear of the tendons. Quality offsets grossness, and combines grace with great weight and power in the best types of draught horses.

Action.—A draught horse will have to do most of his hard work at a walking gait. It is, therefore, of supreme importance that he should be able to walk fast without tiring, and, in order to do this, his action must be perfectly straight and level. The joints must be easily and fully flexed, the feet must advance and be set down without deviations from a straight line.

The soles of the feet should turn up and show plainly to the judge as the horse goes from him, at both walk and trot. The feet should be lifted quickly, fully, and rhythmically, and set down squarely and firmly. There should be no paddling, dishing, cutting, or interfering, nor should the fore legs roll or the hind legs be carried too close together or too far apart. In judging of action note the movements of each leg and foot, the handling of each joint, and the carriage of the entire body as the horse walks and trots around an enclosure, from the observer and to him. Lameness should be absent. The hocks should be carried well together. Rolling in front is due to too great width of chest. Stubby, stilty action in front indicates straight or too upright pasterns or shoulders, foot troubles, or weak knees. Similar action of the hind legs indicates upright pasterns, unsound feet, hock disease, weak stifles, hip weakness, or kidney troubles. Knee and hock action should both be free and comparatively high.

Temperament.—A draught horse should have an energetic disposition, but should be free from vice, docile, tractable, and intelligent. Sluggishness, associated with obesity, is objectionable, and induces diseases such as "grease," eczema, and "lymphangitis."

TROUBLESOME LIGHT-HARNESS HORSES.

Although a jibbing horse is a sore trial to the patience of the driver, it is generally recognised by all experts in horse-training that patience and kindness are far more effective than flogging. A writer in the "Farmer and Stockbreeder" says—

"Some light horses have the trying fault of jibbing, or refusing to draw. This characteristic is not wonderful, seeing that only in modern times have many strains of light horses worn a collar, and the wonder is rather that they take it so kindly. The nearer the thoroughbred they are the more liable to object to the collar, and the question is, how shall such objectors be successfully treated? One that I bred would not, at first, pull your hat off your head, but he eventually made a good, sharp, well-behaved trapper. The prevailing principle is patience. Never let him hear nor see a whip, or you will confirm his bad habits. I went further than that. I put him as wheeler in a tall tandem cart, and hooked in front of him a fast, straight leader that started the trap, and then all went well. A jibber is not necessarily an idle horse that shirks his share of the draught, as when the load is once started he will often do more work than his willing companion. Any pair-horse driving carriage or wagon is a splendid place for a cold-collared horse, and whether he does rightly or wrongly he must always be petted, this being the only road to absolute cure. Besides the never-failing principle of patience and kindness, there is always the reduction of nervous energy by hard work. A ride and drive type of horse which objects to harness should be hunted or otherwise ridden until he is weary, and he will then be less desperate in his fight against that which he considers the indignity of harness work. Ride him long hours, and on arrival home put him in harness for ten minutes, and he soon sees that harness is as comfortable as saddle work."

[We have seen a jibbing horse induced to pull by simply passing a rope round one of the fore legs, just below the knee, and pulling gently on it. Why not try these methods instead of resorting to cruel flogging?—Ed. "Q.A.J."]

Poultry.

NESTS FOR SITTING HENS.

Some make the nests at various distances from the ground or floor, others try to keep them all low. The latter are decidedly to be preferred in hot weather, but now the elevated nests are not objectionable to any extent; the ordinary laying boxes may be employed in hatching, but each one should have a shutter in front with a little round hole in the middle. The hen then usually settles down with her face to the hole. She seems to enjoy the ray of light, and sits better with it. A wide space for the nest is not needed. The eggs are kept better together when confined. In making the nests put a layer of moist fine ashes in the bottom, then a layer of pliable straw, well packed round the sides, and line with soft hay. Do not make a deep hole in the middle, as some of the side eggs will tumble down and be squashed. A soup-plate arrangement is most suitable, and all should be very firm to prevent the eggs from becoming embedded in the material. It is best to make the nests up as they are wanted. If done long beforehand, they lack the sweetness when the hen is put in that she relishes. When completed and the hen ready, put a bad or dummy egg or two in, and always in the dusk in the evening; put the hen on, and close. She may flutter and be wild. To put the whole of the eggs in straight away often results in breakage; hence the object of a trial. Next evening look at the hen. If she will bear handling without fear, it may be taken that she has settled down to her work. If she is restless, let her remain till she settles, but water and feed in the meantime. Some would be ready the following morning, others not for a day or two, and others who do not mean business, but only made a pretence at sitting, will clear out quickly on the first chance. Let them go, for one must be quite sure they are to stay before putting the eggs under.

This should be done in the evening after the hen has been watered and fed. Let the hen find her own way back to the nest and settle again. Then take out the eggs she had on trial and introduce those to be hatched. She will be pleased with the numbers and work gently to get them under her feathers. Next evening, before dark, take her off to feed and water. Carefully catch hold of both wings. There may be eggs under them, which, if roughly handled, might fall down and break. Close the entrance that she cannot rush back to the nest, and let her eat and drink, remain off for fifteen minutes or so, then return. At first they may not go back to the nest quietly, and must be caught and put on, but they soon come to manage this part. It should be seen that they do not change nests. Each one should keep to her own, or trouble may follow. As for feeding, green food is not suitable, only hard corn, wheat, barley, and Indian corn. They must, however, have sufficient, as the work becomes exhausting.—"Agricultural Gazette," London.

HOW TO MAKE HENS LAY IN WINTER.

By M. FERN.

In order to get the best results from hens in winter, a little extra care and attention is necessary. The feeding of condiment and patent egg-producing foods is not desirable, as they tend to over-stimulate the organs, and often lead to disaster.

Birds should be comfortably housed; avoid all draughts. It is not necessary or desirable to completely close in the house on all sides. The open-fronted house will serve the purpose admirably.

The birds should be induced to take plenty of exercise. A few handfuls of grain thrown in to the litter over-night will cause the birds to scratch for a very early feed, and also keep them warm. This is much better than giving the birds a warm mash, the effects of which are only temporary. The result of the exercise for the grain warms the bird and assists to keep her in good condition.

The usual mash can then be fed about 8 o'clock, by which time the birds will be quite ready for their meal. Animal food must be provided in some form, to take the place of grubs, &c., that the birds can obtain for themselves in spring and summer. Liver makes a splendid food; it can be fed twice or thrice a week, boiled, and cut into small dice. The soup can be mixed in the mash. If liver is not obtainable, the dried meat and crushed bone put up by the various meat export firms makes a splendid substitute; this can be fed in hoppers.

Skim milk is another good food for winter. It can be fed in mash or placed in drinking vessels. Green food must be provided in plenty; also grit.

Maize, as an evening grain food, can be largely used, as it is a great heat-producer.

Another great factor in winter laying is in the time of setting eggs. Eggs incubated in winter months from hens that are good winter layers will produce birds that will be themselves good winter layers. This, like other characteristics, is handed down from generation to generation. So the careful breeder would be wise in putting down a few settings from the hens that are in full lay now. Results as to fertility may not be so good as in the spring months, but the chicks hatched will be much stronger and better able to ward off the ailments that the late hatched chick is prone to.

In mating up the pens for breeding at this early part of the season, select a young vigorous cockerel, and mate him to four or five laying hens. It is not advisable to place more than this number of hens till later on in the season.

When placing eggs under a sitting hen at this time of year, do not place more than can be easily covered by the hen—as a rule, ten would be a safe number; if too many are placed under her, some of them are liable to get chilled. Best results will be got by setting the number given; as the season advances, the number can be increased.

PRESERVING EGGS.

In the local markets eggs are taking a downward tendency, and in a few weeks will be still lower in price. The following formulæ for preserving eggs are reliable, they having been tested thoroughly:—

Limewater-Brine Method.

"Limewater-brine has been used for packing eggs for many generations, and the formula is undoubtedly very old. Various modifications of it have been printed from time to time, and every now and then we hear of a new limewater formula for use in the preservation of eggs, but when they are all brought down to bedrock the formulæ are all very much of the same character. Careful test has shown that this method, when properly employed, can be depended upon to preserve eggs for from six months to a year, keeping them in a fairly good condition with very little loss.

Experiments made by the Rhode Island Agricultural Experiment Station resulted in their keeping eggs in limewater-brine solution from 18th May, 1899, to 30th May, 1900. The eggs, after being in the solution more than a year, were in very good condition. The exteriors of the shells were clean and clear, the contents were normal in appearance, and the air-cells had not increased in size. These eggs proved very satisfactory for culinary purposes, but had a rather salt and sharp taste. This peculiar taste is common to all limed eggs if they have been kept any considerable length of time, as the strong alkali and brine are bound to penetrate the shell.

Formula.—The limewater-brine solution is made by mixing 16 ounces of quicklime with 8 ounces of common table salt. This is thoroughly slaked by adding 1 gallon of water that has been boiled and allowed to cool. After the mixture has been thoroughly slaked and well stirred, allow it to settle, and draw off the clear solution. The eggs should be perfectly fresh and clean.

They should be packed in stoneware, glass, or galvanised iron receptacles, and the clear limewater-brine poured over them until it stands 2 or 3 inches above the topmost layer of eggs. The container should be then tightly covered and placed in a cool cellar or cold closet until the eggs are needed for use.

THE WATER-GLASS METHOD.

Water-glass, soluble glass, or silicate of sodium has during the past ten years become recognised as the most reliable and desirable means of preserving eggs. The silicate of potassium has also been used, but is not as desirable as the sodium silicate.

Judging from the correspondence received from "R. P. J." readers during the past year, considerable difficulty has been experienced in obtaining the form of sodium silicate desired for the use in the preservation of eggs. Sodium silicate or soluble glass is met with in commerce in a variety of forms, notably as a solid in crude lumps or glossy masses, or as a crude powder of a whitish-brown colour. It is also obtained as a jelly having a whitish-grey colour.

None of these forms are desirable for the poultryman because of the difficulty in preparing them for use. The sodium silicate which concerns the poultryman is the commercial sodium solution which usually contains about 10 to 12 per cent. of soda and from 20 to 24 per cent. of silica. It is a transparent or nearly transparent, almost colourless, viscid liquid, without odour, but having a salt or sharp alkaline taste. Its specific gravity varies from 1·12 to 1·40.

This solution of sodium silicate or "water-glass syrup" can be obtained through any wholesale druggist; is usually supplied in tin cans and glass or stone jars or jugs, and costs as a rule from 75 cents to 1 dollar per gallon, the price depending largely upon the quantity purchased and upon the ease with which it may be obtained. The majority of tests in the preservation of eggs have been made with the water-glass solution or syrup having a specific gravity of between 1·12 and 1·30. In large quantities, water-glass solution is supplied in hardwood barrels or casks. Care, however, must be taken not to allow nails or other similar metals to come in contact with the solution, as they discolour it. A good quality of water-glass "syrup" should be free from yellow colouring, the yellow usually being traceable to discolouring through contact with iron. Galvanised iron and pure tin do not seem to have any effect upon the solution.

METHOD OF PREPARING WATER-GLASS FOR THE PRESERVATION OF EGGS.

In diluting water-glass, for making an egg-preserving solution, distilled or thoroughly boiled water should be used. The best plan is to add to 1 quart of the water-glass "syrup" 9 quarts of boiled or distilled water, mixing the same thoroughly. When the solution is cool, it is ready for use. The eggs should be fresh gathered, all dirty eggs should be thrown out, and the clean, fresh eggs should be placed small end down in some watertight container that can be covered. It is desirable to "candle" all eggs before packing them. Wooden kegs or buckets are not as desirable as stoneware, galvanised iron, or glassware. At the Maine Experiment Station a galvanised iron tank having a faucet at the bottom for drawing off the solution has been used, and found very satisfactory. After filling the container with layers of eggs, all packed small end downward until a few inches off the top, pour the cool diluted water-glass solution over the eggs until it stands within 2 or 3 inches above the topmost layer of eggs. Cover the container tightly, and set in a cold place until the eggs are wanted for use. The container should always be kept in a cool, clean room, like a milk-room or cold cellar. The room should be well aired, and so far as possible free from any objectionable odours.

Eggs may be kept in this manner for from six months to a year with practically no loss. When desired for use, the solution should be drawn off; the eggs may be washed or rinsed and then placed in racks to dry, when they will be ready to pack in cases for shipping to market, or to be handed over to the cook for household purposes."

The Orchard.

UTILISATION OF LEMONS IN SICILY.

As several fruitgrowers have lately been planting out considerable numbers of lemon-trees, it will no doubt be interesting to them to learn something about the lemon industry in Sicily. A fund of information was obtained on the subject two or three years ago by the Administrator of Dominica, Mr. Hesketh Bell, C.M.G., for the benefit of planters in that island. The first portion of the report deals mainly with the cultivation of citrus fruits, the harvesting, packing, and shipping of oranges and lemons, which have been exhaustively dealt with by Mr. A. H. Benson, Instructor in Fruit Culture here. We wish here to show what can be done in the way of extracting essence of lemon, manufacture of orange-flower water, and the pickling of lemon and orange peel for export.

As far as the lemon-tree is concerned, it requires an equable temperature, and, in Sicily, lands bordering on the coast line are the most favourable. In Queensland, on the other hand, we find the very finest lemons produced in the Western country, 400 miles from the coast. Yet, in Europe, they cannot be reared on a coast exposed to strong south-east winds, nor in localities subject to frost. The north-west winds are most injurious, from which they have to be protected by intervening trees. Precautions to be taken against frost are indispensable. A keen wind will often blight a whole crop, in which case all branches that have been frost-bitten must be cut away. The ground is hoed round the lemon-trees three times a year, and watered twice a week. It takes 37,075 cubic feet of water to irrigate 2½ acres twice.

When the lemons are picked for exportation, they are first cut in two and immersed in salt water for from three to eight days. They are then placed in casks, with alternate layers of salt. Salt water is then introduced to fill up spaces, and the cask is ready for exportation. The manufacture of orange-flower water is another industry in this connection. The petals of the blossoms, whether of lemon or orange, that fall off and cover the ground as soon as the fruit appears are gathered up and utilised for making orange-flower water.

The trade in pickled (salted) lemon and orange peel is almost entirely confined to Messina, whence some 2,000 tons are exported annually.

The salt and water, it should be stated, are in the proportion of 20 kilogrammes (44 lb.) of rough salt to 100 kilogrammes (220 lb.) of water. This quantity will suffice for 350 kilos (770 lb.) of peel. The local price per barrel is 23 lires (17s. 7d.) for pickled lemon peel, and 31 lires (21s. 10d.) per barrel for pickled bitter oranges. Citrons, sliced in half, with their pulp, are also exported. The best kinds of citrons are the "Diamante," weighing from 1 lb. to 2 lb. each; price, £5 12s. to £6 8s. per barrel of 350 lb.; and the Calabrian citron, same weights, £4 1s. 8d. to £4 12s. per barrel.

The essence of lemon is made from inferior and refuse lemons, unfit for export in any other shape.

It costs about 1s. 4d. to extract the essence of 1,000 lemons, and £4 to make a cask of lemon juice, including fruit, cost of cask, and labour. The remnant of the fruit on a tree after all the best lemons have been gathered is used for essence, and will yield about 12 oz. of essence and about 42 litres (about 9 gallons) of raw lemon juice. Essence is worth 2s. 5d. per lb., f.o.b. Palermo, including coppers. It will not keep good except in well-soldered and tinned coppers.

In Sicily the very greatest care is taken in the operations which precede the shipments of citrus fruits to foreign countries. At the time of gathering, a

preliminary sorting takes place, either in the open air or in the stores on the plantations. The fruit is divided into three classes—(1) largest, healthiest, and finest in appearance; (2) sound fruit of good quality, but of smaller size and less regular in shape; (3) deformed, withered, or spotted fruit, or fruit liable to early decomposition. The average of 1,000 generally comes about 300 to 500 of the first quality; 500 to 300 of the second, and 200 to 300 of the inferior quality and waste; but these proportions may vary considerably, according to locality, treatment of the trees, and the atmospheric influences of the year. The proprietors generally sell their crops by contract before they are gathered to speculators, but have to fix a certain latest date for delivery. These sales are effected through intermediate brokers called "country brokers."

PRODUCTION OF AN AVERAGE PLANTATION.

The following is a fair proportion of the divers kinds of lemons grown on a plantation of average size, which produces, we will say, 110,000 lemons annually:—

Month.	Number of Lemons Gathered.
October	15,000
November	30,000
December	24,000
January	20,000
February	10,000
March	1,000
April-September	9,000

The last is only approximate, because it depends on whether the trees have been forced or not.

	Large. s.	Large. d.	Small. s.	Small. d.
Cost of case	0	9	0	6
Cost of paper	0	6	0	4
Cost of gathering and packing	0	1	0	3
Nails and hoops	0	1	0	1
	1	0	1	2

The management of a lemon plantation demands great attention. Trees should be trained high to admit free ventilation, pruning to take place regularly once a year; dead wood, unhealthy and redundant branches removed. In cases of a heavy crop the branches are to be supported; trees to be watered in summer with a little liquid manure in the water once a week, and the ground kept free from all undergrowth. Market gardening is occasionally practised between the trees because the vegetables grown pay expenses for manure and cultivation; but it is not to be recommended, as the fruit suffers in consequence.

The tree should always be grafted on the bitter orange; if grown from the pip, it is subject to a disease called the gum, which often destroys it. Grafting takes place after three years, and is practised in the same way as on the rose-tree.

Besides 2,000 tons of pickled citrus fruits, over 2,000 tons of lemon juice and 413 tons of essential oils are exported. The fresh lemons and oranges exported average 52,000 tons of oranges and 65,000 tons of lemons in cases. It will thus be seen that the industry as carried on in Sicily is of considerable magnitude. It is Mr. Benson's opinion that Queensland can produce even better lemons than Sicily, and that if growers would enter earnestly upon the lemon industry they could ere long supply the wants of the Commonwealth to the exclusion of the foreign article.

LEMON AND CITRON GROWING.

By ALBERT H. BENSON.

Although the growing of citrus fruits has made steady progress in this State during recent years, the extension of the industry is mainly in the production of oranges and mandarins. The growth of lemons and citrons—for which parts of this State are admirably adapted—has been neglected to a certain extent, so much so that we do not produce enough for our local requirements.

The reason for this unsatisfactory condition in the case of the lemon is mainly due to the fact that in the older citrus-growing districts on the coast this fruit, although the trees crop heavily, is apt to be of poor quality. The fruit grows to a large size; the skin is coarse, thick, often warty or scabby; the pulp is coarse, often gummy; there is a heavy rag, and the juice is of low quality. This is due to climatic and soil conditions, as too much humidity, especially where the soil is at all rich, induces a heavy tree growth and the production of large, coarse fruit. Fruit of this type is difficult to dispose of, as it keeps badly, and both for peel and juice it is of inferior quality. This being so, growers have not extended their lemon gardens, as in many cases the fruit has not paid to grow. Given the right soil and climate, however, we can produce lemons of the finest quality, equal to anything now imported, either from the South or oversea, and there should, therefore, be no necessity for us to import a single lemon or a single lemon-peel into this State. My object in writing this article is to show how this can be done—viz., to describe the soil and climate best adapted to the growth of high-class fruit; and, secondly, to describe the method of gathering and handling the fruit, so that it can be kept from times of plenty, when it is hard to dispose of at a profit, to times of scarcity, when it will bring a good price, and take the place of the imported article, as, when we can produce such a fruit, there is no necessity for us to be sending money out of the State that should be kept at home.

The lemon requires a sandy or sandy loamy soil, of good depth, and possessing perfect natural drainage, to be grown to perfection in this State. It does not do where the atmosphere is too humid, but is at its best in a comparatively dry air, provided that there is a sufficient rainfall or artificial means of providing water to supply the soil with the necessary moisture required for the proper development of the tree and fruit, and that the temperature in winter does not fall so low as to cause serious injury to the tree, as it will not stand much frost. Light frosts will kill back the young growth, but not do any very serious damage to the tree, but a heavy frost will kill it down to the ground.

Soils such as I have described may be found in many parts of the State, together with a suitable climate, the following districts being well adapted for the growth of high-class lemons in the Southern part of the State:—

First.—The foothills of the Coast Range and the upper parts of the valleys or watercourses leading up to them: such as the upper parts of Nerang, Coomera, Albert and Logan Rivers on the south coast; the upper waters of the Lockyer and its tributaries, under the Main Range; the sandy loams of the Esk district and Upper Burnett.

Second.—The sandy loams of the Western and South-western Downs, such as are met with at St. George and Chinchilla, where free from frost.

Third.—The sandy loams of Roma, Mitchell, and further west, where free from frost.

In the Central district good lemons can be grown on the sandy alluvial creeks to the west of Rockhampton; on sandy soil in the Emerald district, and throughout the desert country to the west of the Drummond Range, where there is suitable artesian water available for irrigation. This desert country

in the neighbourhood of Barcaldine is producing very fine fruit: a sample exhibited at the recent Rockhampton show being equal to anything I have seen in Australia.

The Western soils, both in the South and Central West, are usually of a red colour, they are by no means rich in organic matter or in plant food, but when well worked retain moisture well during a dry spell. With judicious irrigation when necessary, and thorough cultivation, they are, in my opinion, quite equal to the lemon soils of Southern California, if not superior to them; further, they resemble these soils in many respects, but differ from them in one very important consideration—viz., in the matter of cost—as our lands can be purchased for a very small fraction of the cost of the Californian lands. The soils in the Esk district suitable for lemon culture are similar in appearance and texture to these Western soils, but with the more regular rainfall they will grow fine fruit without irrigation, provided the land is well and deeply worked, so that it will retain moisture during a dry spell.

The other soils in the foothills that are suitable for lemon-growing are usually of alluvial origin, of a more or less sandy nature, and not too rich; in fact, too rich soils cause the trees to make an excessive growth and to produce coarse fruit, whereas the poorer soils incline more towards the production of fruit of superior quality. It is not so much a question of variety as of suitable soil and climate, as any good kind of lemon will produce good fruit when grown under the right conditions, whereas the same variety grown under less favourable conditions will run to wood, and produce an inferior article.

The type of fruit that is wanted is of medium size, not exceeding $2\frac{1}{2}$ to $2\frac{3}{4}$ inches in diameter when fresh, and even then the larger size is better suited for peel than canning.

The skin must be fine, free from blemish, and of a pale-yellow colour. It must be free from acridity, and of a pleasant flavour. The pulp should be of fine texture, full of juice, of a sharp acid flavour, and be as free from rag as possible.

Absence of seeds is an advantage, but only if the fruit is of equal merit in every other particular.

For peel, the fruit may be of rather larger size if wished, but the skin must be smooth, bright, and free from blemish, and from $\frac{1}{4}$ to $\frac{3}{8}$ of an inch, but not more, in thickness, so that if the finer and thinner skinned fruit are selected for curing the larger and thicker skinned fruit are suitable for peel; in fact, are preferable to those having the finest skin.

The first thing to know is when to gather the fruit and how to gather it, and this is where our growers, as a rule, go astray. The fruit should always be cut from the tree—not pulled—as soon as it shows signs of colouring; don't let it remain on the tree, as if you do, it will only increase the thickness of the skin at the expense of its bright colour, and will decrease its keeping qualities. Cut it carefully, taking care not to injure the skin in any way; handle it like an egg, as a bruised lemon is a spoilt lemon. Grade it for peel or for curing, and treat the fruit to be cured as follows:—Place it loosely, without bruising, in a well-ventilated case, and stack the cases in a well-ventilated shed for a few days to toughen the skin. The time depends on the condition of the atmosphere, being longer when it is moist and shorter when dry. The object is to dry the surplus moisture from the skin without shrivelling it. The fruit should then be gone over carefully to cull out any that show signs of injury; the sound fruit should be wrapped in tissue paper and replaced loosely in the cases, which should then be stored in a sweet, dry, cool building, in which an even temperature can be maintained. The fruit should be examined from time to time, so as to remove any that show signs of mould or rotting, and, when required for market, should be rewrapped and firmly packed in cases. Fruit so treated will keep for months in perfect condition, and once cured it will stand a lot of knocking about.

Mr. W. J. Allen, Fruit Expert to the New South Wales Department of Agriculture, who has recently paid a visit to California, describes the method of lemon-curing in vogue there in an article that appears in June number of the "Agricultural Gazette," and, whilst bearing out what I have stated above as regards the gathering and first part of the curing, he states that, when the fruit is to be cured rapidly, it is first graded and cleaned; it is then stacked in the curing-shed and covered with a canvas cover. Such a stack is 10 feet by 10 feet by 20 feet, and space is left at one end to allow of a kerosene stove with three large burners being placed under the cover. Over the stove there is an iron tank, partly filled with water. The heat thus generated keeps the stack at a temperature of 90 degrees Fahr., and this temperature is maintained from one to two weeks, till the fruit is all of a pale-straw colour, when it is graded, packed, and marketed.

This method, according to Mr. Allen, is in common use in California, as all lemons are there cured before being placed on the market. In this State, however, it is not so much a question of rapid curing as curing to keep that is required, though a cured lemon is always better than a fresh lemon for general use, squashes, &c. The illustration of cured and uncured lemons accompanying this shows the type of fruit we want. The uncured fruit was grown near Esk, and the cured fruit, which has been cut nearly four months, was grown near Helidon.

As showing the market that there is for cured lemons in this State, we depend almost entirely on the imported fruit for all our summer requirements —fruit that is grown either in Southern Europe or California, and for which we have often to pay a very high price; whereas we have little sale for our winter fruit, which, were it cured, would, in conjunction with the summer crop, carry us over the hot weather without our having to depend on outside productions.

With regard to lemons suitable for peel, the demand is equally good, as our manufacturers are obliged at present to import something like 100 tons of peel in brine yearly for local requirements, and this quantity of peel would take some 250 tons of fresh lemons to produce; or, allowing 50 bushel cases of fruit to the ton, 12,500 cases of fresh fruit. Our climate is very suitable for the manufacture of peel, and, given a good quality of skin locally grown, there is no reason why we should not be able to compete favourably in outside markets, as we can, and do, manufacture peel of high quality. There is a further advantage in growing the fruit locally, and that is—if produced in sufficient quantity, use can be made of the juice of the lemon, as it pays to extract it, pasteurise it, and put up in bottles for bar, soft drinks, or private use, and would take the place of the imported article now used for these purposes.

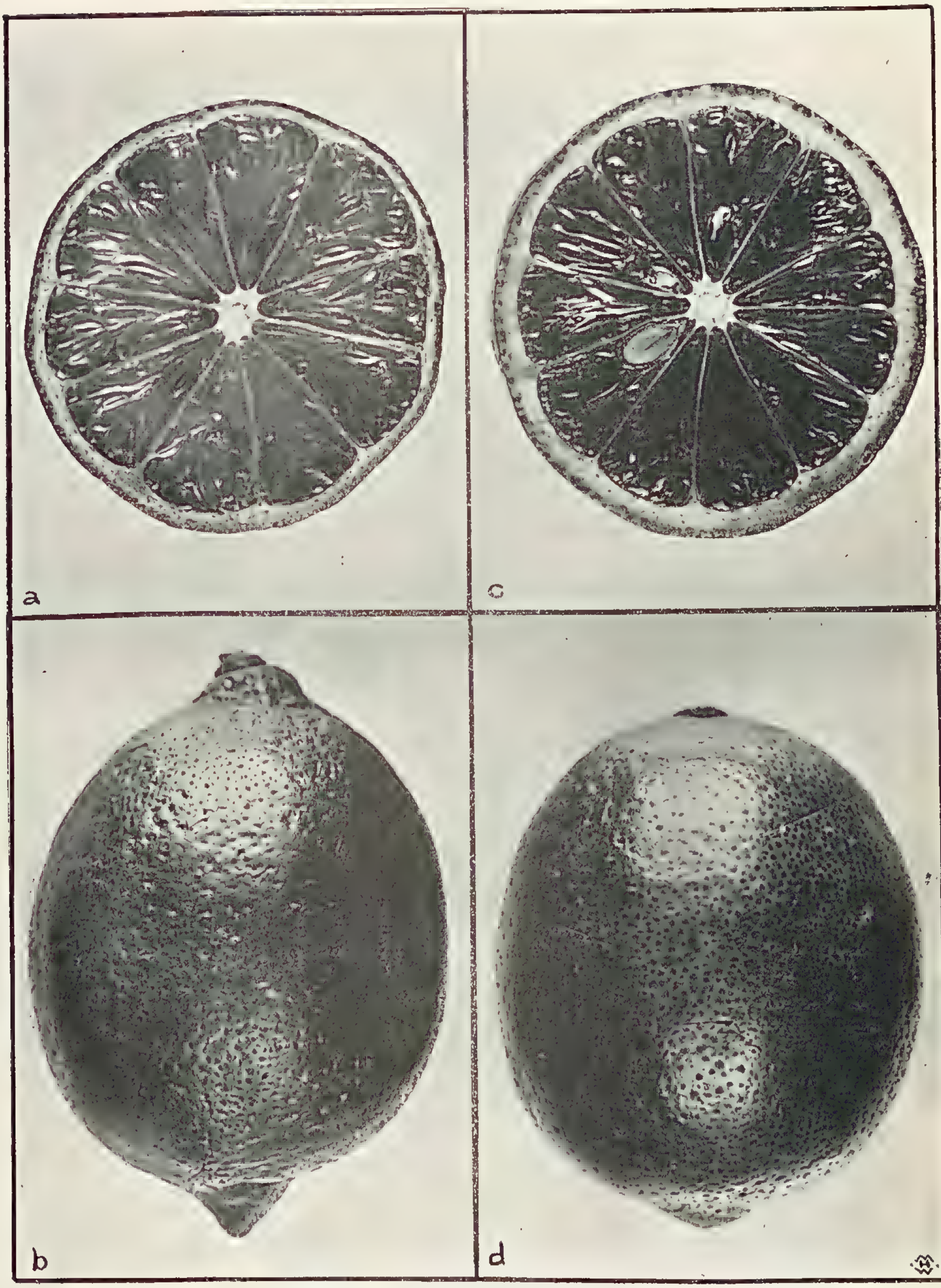
Several varieties of lemons are grown in the State, but, for commercial purposes, a good lemon of the Lisbon type is about the best. The common or rough lemon is of no use for peel, and is decidedly inferior for making a squash. The Lisbon lemon does well on either the sweet orange, Seville orange, or common lemon stock; the Seville orange stock, in my opinion, being the best, especially for the warmer and drier parts, on account of its deeper-rooting qualities.

The Citron.

The culture of this fruit in this State has practically been confined to the planting of two or three trees in the orchard, or more often in waste spots, near fences, &c., and has not been taken up on commercial lines.

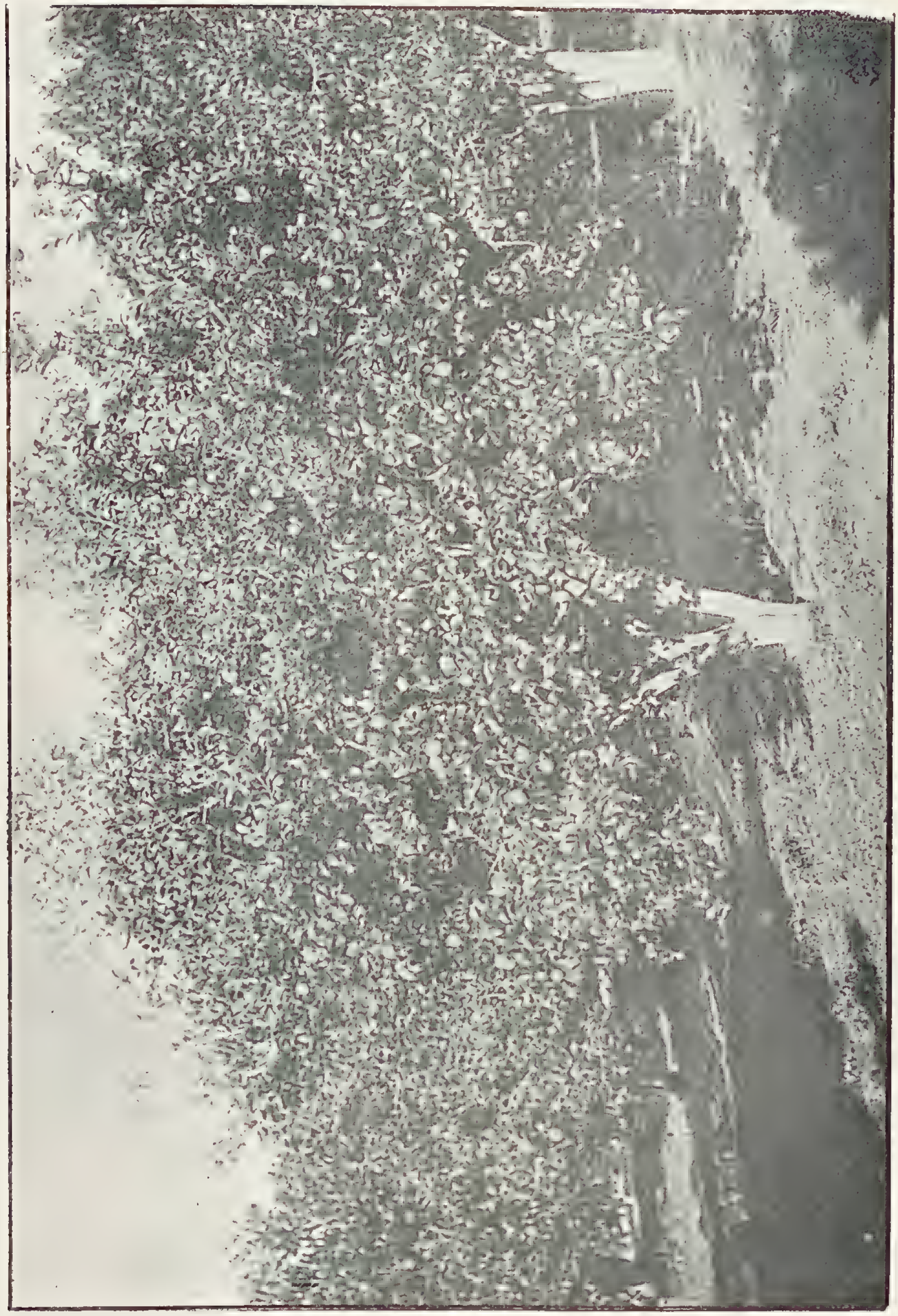
The reason for this has been due to the fact that there has only been a very limited demand for this fruit in the past, as the quantity of citron peel consumed locally only amounts to a very small proportion of that of lemon or orange.

Plate VI.



A.—Section of Cured Lemon from Helidon.
B.—Cured Lemon from Helidon.
C.—Section Uncured Lemon from Esk.
D.—Uncured Lemon from Esk.

Plate VII.



Lisbon Lemon Tree in Fruit, Esk District.

Now, however, there is a demand for the peel, which is costing our manufacturers 42s. per cwt. c.i.f. in brine, at which rate there is a big profit for the grower.

The citron will grow anywhere in the coastal districts where the soil is suitable for citrus culture, and is one of the hardiest of the family. It will hold its own against grass and weeds, and is often found growing practically wild, without any cultivation or attention whatever. Even under such conditions it bears heavily and produces good fruit, when free from scale, but the tree, when neglected, is often badly infested with red scale. Given reasonable care and attention—such as cultivating the land to keep down weed growth and to retain moisture in the soil, pruning to keep the tree in shape, and cyaniding to keep down red scale—and I am of opinion that we can produce citrons of such quality and at such a price that, instead of our having to import peel for the manufacture of the candied article, we should be able to put up the finished article here at a price that would enable us to compete in the open markets of the world.

Were the trees looked after as described, the size and quality of the fruit would be greatly improved, and the crop that we could grow would be several times greater than that of the citron orchards of Italy or Sicily. We can produce the raw material at a much smaller cost than it can be grown at in Southern Europe, and, therefore, as our climate is so well suited for the manufacture of peel, there is nothing to prevent us getting a good share of the world's market.

There are several good types of citrons growing in the State, of which the lemon-shaped or Knight's citron and the round or Bengal citron are two of the best; but, to insure the best fruit, and the cleanest and heaviest skins, it will be necessary to propagate nothing but the very choicest types. The citron can be worked on the common lemon stock, and should be planted out at from 16 to 20 feet apart each way. This will give room for the trees to spread and provide the necessary root space, whereas when planted closer together the trees become dwarfed, and are mere bushes. For the local trade the fruit may be allowed to turn yellow before it is cut, but once we go in for the manufacture of citron peel for the world's markets the fruit must be cut green, as a thick skin that cures a dark olive-green colour is the one that is most in demand.

ANTHRACNOSE OR BLACK SPOT IN GRAPES.

By ALBERT H. BENSON.

As the time is approaching when the winter dressing of vines as a preventive for black spot should be carried out, I again bring under the notice of the readers of this Journal the necessity for attending to this important work, as if the winter dressing is neglected there is little chance of keeping the pest in check later on.

Last year black spot was very much in evidence throughout the State, the weather conditions, which were so favourable for the farmers and dairymen, being the very thing for its rapid development. Heat and moisture combined are the conditions under which it thrives best, but a dry heat either prevents its germination or so retards it that it does little damage. Owing to the prevalence of the pest last season, it is especially important not to neglect the winter treatment, as the vines are now well infested with the dormant spores of the fungus, which are ready to develop as soon as the conditions are favourable for their doing so.

These spores must be killed, and the best method of doing so is as follows:—

First.—Add ¾ of a pint of sulphuric acid to a gallon of water, and either swab or spray it on the vines just as the buds begin to swell. It should be applied with considerable force, so as to reach every part of the vine.

Second.—Dissolve 5 lb. of sulphate of iron in 1 gallon of water. When dissolved add to the mixture ½ lb. (¼ pint) of sulphuric acid, and apply as above.

NOTE.—Always add the acid to the water; not the water to the acid.

Both of these dressings are efficacious if applied properly, but to be a success every part of the vine must be reached; and it is advisable also to dress the stakes as well, as they harbour many spores, which may easily be blown on to the young wood, and thus start the disease.

The best method of application is undoubtedly in the form of a spray, applied with sufficient force to drive it into every crack and crevice of the vine, but the difficulty has been to get a machine to apply it. This difficulty has, however, been overcome by the Tyree automatic sprayer, which does the work well. Naturally the acid acts on the metal of the sprayer to a certain extent, and the nozzles will not stand long, but even with these drawbacks it is a vast improvement on the old tedious method of hand swabbing. After using, the sprayer should be well cleaned out with plenty of fresh water, as if this is neglected it will very soon be worn out.

The winter dressing is the most important, and in many cases it is all that is necessary, but in districts that are climatically adapted for the propagation of the fungus spring treatment is necessary as well. This consists of spraying the vines with Bordeaux mixture—first, when the young shoots are 2 to 3 inches long; second, just before flowering, and again, when necessary, up to the time the grapes begin to form their stones. Bordeaux mixture is made as follows:—

Summer Strength.—6 lb. bluestone, 4 lb. of unslacked lime, 40 gallons of water.

Prepare as follows:—

(1) Dissolve 6 lb. of bluestone in 20 gallons of cold water in one cask, by placing it in a bag and suspending it in the water.

(2) Slack 4 lb. of unslacked line in another cask slowly by first pouring about 3 pints of water over it. This will reduce the lime to a thick cream free from lumps. Water should now be added, stirring well till there are 20 gallons of milk of lime in the cask.

(3) Stir the milk of lime up well, strain it, and pour the whole of the 20 gallons of milk of lime and the 20 gallons of bluestone water together slowly into a third cask; stir well for 3 minutes, and if properly made the mixture is fit for use.

The mixture is much better if made in this manner than when a strong solution of bluestone and lime is first mixed together, and water to make up the required quantity is afterwards added.

In order to see if the mixture is properly made, plunge the blade of a knife into it for a minute. If the knife is untarnished, the mixture is all right; but if the knife is stained a coppery colour, then more milk of lime must be added.

The mixture should always be neutral, as if there is an excess of bluestone it is apt to injure the foliage. Use water that is free from iron, and do not make the mixture in iron, zinc, or tin vessels of any kind—wood is the best.

If desirable, a stock solution of bluestone may be kept on hand for use as required. Such a solution may be made by dissolving 100 lb. of bluestone in 50 gallons of water. Place the 100 lb. of bluestone in a bag and suspend it in the cask of water, and in the course of a couple of days the whole of the bluestone will be dissolved, and each gallon of the solution will contain 2 lb. of bluestone.

To make the 40-gallon solution you therefore take 3 gallons of the stock solution of bluestone and add 17 gallons of water to it, to make up the 20 gallons of bluestone solution for mixing with the 20 gallons of milk of lime as previously described. A stock solution of milk of lime can also be made, but it is better to make it as required.

Plate VIII.

Jack Fruit Tree, Twenty Years Old, Growing at Kangaroo Point.

Bordeaux mixture is a fungicide, and it is of little value as an insecticide. It, however, combines well with arsenical poisons, in which state it is a very good combined spray.

When fresh lime is hard to procure, washing soda may be used in place of it, the proportion being 6 lb. of bluestone, 9 lb. of washing soda, to 50 gallons of water. It is a good remedy, but not quite equal to Bordeaux mixture.

JACK FRUIT.

The accompanying illustration shows how easily the jack fruit may be grown in the neighbourhood of Brisbane. The fruit was grown by Mr. S. T. Shackel, Thorn street, Kangaroo Point. The tree was planted twenty years ago in a corner of the garden, and received no care whatever, yet it bore one fruit a few years later weighing 70 lb. Yet it has grown well, and this year bore several dozen of very large fruit ranging from 20 to 35 lb. in weight. Although the jack fruit emits a very powerful and unpleasant smell when first opened, the odour soon passes away, and the rich, sweet nodules filling up the inside are most delicious to the taste.

Times of Sunrise and Sunset at Brisbane, 1907.

Date.	May.		June.		July.		August.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·13	5·17	6·30	5·1	6·39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·4	6·30	5·19
3	6·14	5·15	6·31	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·29	5·20
5	6·15	5·14	6·32	5·0	6·39	5·5	6·28	5·20
6	6·16	5·13	6·32	5·0	6·39	5·5	6·27	5·21
7	6·16	5·12	6·33	5·0	6·39	5·6	6·27	5·21
8	6·17	5·12	6·33	5·0	6·39	5·6	6·26	5·22
9	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
10	6·18	5·10	6·34	5·0	6·39	5·7	6·24	5·23
11	6·18	5·10	6·34	5·0	6·39	5·7	6·24	5·23
12	6·19	5·9	6·35	5·0	6·39	5·8	6·23	5·24
13	6·20	5·8	6·35	5·0	6·38	5·8	6·22	5·24
14	6·20	5·8	6·36	4·59	6·38	5·9	6·21	5·25
15	6·21	5·7	6·36	4·59	6·38	5·9	6·20	5·25
16	6·21	5·7	6·36	5·0	6·38	5·10	6·19	5·26
17	6·22	5·6	6·37	5·0	6·37	5·10	6·18	5·26
18	6·23	5·6	6·37	5·0	6·37	5·11	6·18	5·27
19	6·23	5·5	6·37	5·0	6·37	5·12	6·17	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·16	5·28
21	6·24	5·4	6·38	5·0	6·36	5·13	6·15	5·28
22	6·25	5·4	6·38	5·1	6·35	5·13	6·14	5·29
23	6·25	5·3	6·38	5·1	6·35	5·14	6·13	5·29
24	6·26	5·3	6·38	5·1	6·35	5·14	6·12	5·30
25	6·26	5·2	6·39	5·1	6·34	5·15	6·11	5·30
26	6·27	5·2	6·39	5·2	6·33	5·15	6·10	5·31
27	6·27	5·2	6·39	5·2	6·33	5·16	6·9	5·31
28	6·28	5·2	6·39	5·2	6·32	5·16	6·8	5·32
29	6·28	5·1	6·39	5·3	6·32	5·17	6·7	5·32
30	6·29	5·1	6·39	5·3	6·31	5·17	6·6	5·32
31	6·30	5·1	...	...	6·31	5·18	6·5	5·33

Phases of the Moon.

			H. M.
5 May	☽	Last Quarter	7 53 a.m.
12 ,,	●	New Moon	6 59 p.m.
20 ,,	☾	First Quarter	11 27 ,,
28 ,,	○	Full Moon	0 18 a.m.
3 June	☽	Last Quarter	3 20 p.m.
11 ,,	●	New Moon	9 50 a.m.
19 ,,	☾	First Quarter	0 55 p.m.
26 ,,	○	Full Moon	7 27 a.m.
3 July	☽	Last Quarter	0 34 a.m.
11 ,,	●	New Moon	1 17 ,,
18 ,,	☾	First Quarter	11 12 p.m.
25 ,,	○	Full Moon	2 29 ,,
1 Aug.	☽	Last Quarter	0 25 p.m.
9 ,,	●	New Moon	4 36 ,,
17 ,,	☾	First Quarter	7 5 a.m.
23 ,,	○	Full Moon	10 15 p.m.
31 ,,	☽	Last Quarter	3 28 a.m.

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	Rockhampton.		Townsville.		Cooktown	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
May	2 m.	18 m.	13 m.	41 m.	12 m.	50 m.
June	1 m.	19 m.	10 m.	44 m.	7 m.	55 m.
July	2 m.	18 m.	10 m.	44 m.	9 m.	53 m.
August	5 m.	15 m.	18 m.	36 m.	16 m.	46 m.

Horticulture.

ORCHID NOTES FOR BEGINNERS.

[Read by Mr. E. J. Beard, before the Queensland Horticultural Society, on 17th July, 1907.]

It is remarkable in a plant-loving community like Brisbane what a lack of knowledge exists respecting orchids and their habits, mode of culture, and cost. Every second person you meet will tell you that orchids are too expensive or too difficult to grow. This short paper, which is written with the object of assisting those about to grow these beautiful flowers, will, I hope, convince some at least that orchids are not difficult to grow in Brisbane if a judicious choice of sorts is made, and a little thought is bestowed upon their natural habits, while the question of cost is trifling. Our warm summer and the mildness of our winter are all in favour of growing most of the varieties, and, provided an easterly aspect is chosen and the plants sheltered from westerly winds, they can be grown fairly successfully even in the open air upon frangipanni, jacaranda, poinciana, plum, or apple trees, though, of course, all the varieties will not stand the severity of our summer sun under these conditions.

In commencing to get together a collection of orchids, the beginner will do well to start with the varieties that find their native habitat in Queensland. The purple varieties from North Queensland are fairly common in Brisbane, yet how few people make them do well. I saw some quite recently on a friend's veranda post—upside down, tied loosely, and in such a position that they never got any moisture from dew or rain. Little wonder that they did not succeed with him. The two purple varieties referred to are *Dendrobium bigibbum* and *Dendrobium phalænopsis*. They are obtainable at Cooktown and other far Northern ports very cheaply, and if given an easterly aspect, with shelter from our westerly winds, they do remarkably well. They can be grown on frangipanni or other trees, but do equally well on hardwood blocks, provided a little peat or moss is attached firmly to them with copper wire. In fixing on the plants see that they are firmly tied, otherwise the young roots may be injured should the plant sway about. During the warm weather, when the plants are growing, they should be watered daily. After they have bloomed (which is in the autumn) water should be gradually withheld, and during the winter, which is their resting season, very little water should be given—just sufficient, in fact, to prevent shrivelling. Another lovely purple orchid from the far North is *Dendrobium superbiens*, but this is not so plentiful nor so cheap as the other varieties. *Dendrobium undulatum* is fairly plentiful about the Cairns district, and does splendidly around Brisbane outside. It has a robust habit, the stems or pseudo bulbs attaining a height of 8 or 10 feet. The flowers, which vary a lot, are in colour of various shades of a beautiful golden brown, and, as the name indicates, are very much twisted and crinkled. This variety throws a fine spray of flowers, bearing up to twenty on a flower spike, and is an excellent variety for ladies' sprays. It should be given plenty of moisture and sunshine. If grown in a shady bush-house, it does not flower freely. *Dendrobium canaliculatum*, so named on account of the canal-shaped leaf, has a pseudo bulb not unlike an onion. It is fairly plentiful in the Mackay district, where it grows on the ti-trees—particularly on the sea-shore—exposed to the sun. It has a lovely flower, white with a prettily marked purple and orange lip, and has a very sweet perfume. This should be given a sunny position also. *Dendrobium Kingianum* is another favourite orchid with beginners. It is obtainable on most of the mountains near Brisbane, but more particularly on the Main Range. It grows on moss-covered rocks, and during the spring months its beautiful pale-pink, dark-pink, and light-purple flowers are a sight worth beholding. It likes a shady position, and grows well in a basket with good drainage and a little peat or moss over its roots. *Dendrobium delicatum* is a fine variety, having a habit something like Kingianum, though the flowers are larger and open out

better. It has beautiful large sprays of creamy white flowers, and possesses a very fragrant perfume. It is one of the finest of Queensland orchids, and is getting very scarce. It grows on the Main Range, near Toowoomba. It likes a shady position, and should be given similar treatment to Kingianum.

Sarcochilus cecilliæ is another little favourite with beginners. It has light-pink flowers, is very floriferous, and possesses a distinct and pleasant scent. It grows naturally on moss-covered rocks, but does equally well in cultivation on trees or in pans containing plenty of broken crocks, with a layer of sphagnum or other moss over its roots. Writer sent home to England a clump of this variety, and though the flower is small it is prized very much by the friend who received it.

All the foregoing are Epiphytes—*i.e.*, plants which grow upon trees—but some of the terrestrial kinds are well worth inclusion in any collection.

Calanthe veratrifolia has pretty snow-white flowers, and makes a nice display in summer. A case of this variety was sent to England some years ago, and arrived in full bloom. It was sent to a flower show on the Continent, and was awarded a silver medal by the judges as an exhibit of exceptional merit. *Phaius grandifolius* and *Phaius Bernaysii* also do well, and have much bolder flowers than the Calanthe named. They require a shady position, and, having fleshy roots like the Calanthes, should be grown in a compost of fibrous peat, sand, and light loam, with plenty of good drainage.

The foregoing varieties do not embrace all that are available in Queensland, but are sufficient for this short article. Should the beginner wish to add a few of the imported kinds, it can be done at very little cost, and, as the varieties I shall name are hardy, with practically very little risk of loss. *Dendrobium nobile* is one of the greatest favourites, and it does well in an ordinary bush-house. During the warm weather, when in a growing state, plenty of moisture is required. After the growths have matured, withhold water and give only sufficient to prevent shrivelling. The winter is the resting season, and, unless the plants get a decided rest to harden their growths or pseudo bulbs, few if any flowers will be given in the spring. Small plants can be imported from about 2s. 6d. each upwards. A plant of Nobile recently flowered in Brisbane with 502 blooms, a record that it is possible has not been exceeded in any part of the world. I mention this to show how suitable our climate is for some orchids provided the proper treatment is given them.

Dendrobium Thyrsiflorum is another hardy variety. It is not deciduous, however, so does not relish the drying in winter that Nobile can. It must not be allowed to shrivel or lose its leaves, otherwise a certain amount of natural strength in the plant will be lost. Its lovely tresses of white and orange flowers make it a grand variety for showing. *Dendrobium densiflorum* and *Farmeri* are two other fine varieties of the evergreen habit, which do remarkably well here under ordinary bush-house conditions. They, too, have beautiful tresses of orange and white and yellow respectively, and, like Thyrsiflorum, are fine show varieties. *Dendrobium wardianum* possesses a truly noble flower of great substance. It is a waxy white, tipped with amethyst purple. The throat is ochre yellow, with two dark sanguineous blotches at the base. Like Nobile, is another variety which does remarkably well here. It is one of the grandest fibrous peat, crocks, and sphagnum, with abundant drainage. *Cattleya labiata* is another variety which does remarkably well here. It is one of the grandest of all orchids, and hails from Brazil. There are many shades of this beautiful orchid, from a blush rose to a deep rosy purple. It flowers in sheaths of four or five flowers to a pseudo bulb, each flower measuring up to 8 inches across when fully expanded. The throat is usually marked with yellow, and the lip from a light shade to a very dark purple, and some varieties have a beautifully fringed and wavy lip. *Cattleya Trianæ* resembles the foregoing somewhat, likewise *Cattleya Mossiæ*, and some splendid specimens are to be seen among local growers. There are quite a number of other popular sorts in the Cattleya section well worth the attention of beginners, but I must be brief, so I shall

pass them on this occasion, but cannot omit *Cattleya Harrisoni*, which throws sheaths with several flowers varying in shade from lilac to dark magenta, with a yellow and well-shaped lip. It is another hardy inexpensive sort, which thrives and blooms well here.

The slipper orchids, which are called Cypripediums, possess a form peculiar and interesting by reason of the extraordinary shape and structure of the flowers. The upper or dorsal sepal is usually large, and the brightest feature of the flower, while the lip or labellum takes the form of a slipper-shaped bag. This family of orchids is terrestrial in habit, and possesses no pseudo bulbs, the flower spike being produced from the centre of the leaves, which in many species are beautifully mottled. Cypripediums require a compost of fibrous peat, sand, and leaf mould, and a moist, shady position, and do not need the rest necessary with some of the other species named. Cypripedium, Barbatum, Insigne, Callosum, Exul, Lawrencianum, Spicerianum, Venustum, and Villosum are all doing well in the local collections, so that fact, combined with their cheapness, warrants my recommending them as suitable for beginners. *Lælia anceps* is another fairly hardy orchid that does splendidly when once established. It blooms in late autumn, when flowers are scarce. It comes from Mexico, and likes outside treatment. The flowers are variable, and are borne on tall spikes of five or six flowers of a rose colour, the lip being crimson purple, with yellow and red stripes.

There are, of course, hundreds of other orchids which I could include in this article, but the foregoing is sufficient to enable beginners to get together a collection which will comprise many beautiful and hardy sorts that will well repay them for the little attention required in the way of watering and other attentions during their growing seasons.

Frequently one reads of fabulous prices being given for orchids, and this more often leads the uninitiated to suppose that the extreme loveliness of the flowers borne by the plants purchased is the reason for their high value. In rare cases this may be so, but it is generally the rarity of the plant that commands the price, and it is possible a lover of flowers not versed in orchids, if offered the choice of a 500-guinea plant or one sold usually for half-a-crown, might choose the latter as the more beautiful of the two.

In potting or basketing orchids care should be taken that the eyes of the plant are not covered. They are always at the base of the previous year's growth, and it is of vital importance that the potting material does not cover them. Fill the receptacle partly with broken crocks, cover this with some moss or similar material to prevent the compost from clogging the drainage; then add the compost, and see that the orchid is potted firmly and staked so that it is fairly rigid. If any of the roots of the plant are dead or broken, it is better to sever them with a sharp knife. See that the roots are not bruised or broken in any way when potting, and above all do not over-pot. Orchids, as a rule, do better in small receptacles than in large ones. To a beginner this may be difficult to understand, but it is a fact worth remembering. Do not allow the compost to become wet or sour, or the plants will not thrive and will be attacked by disease. Orchids are lovers of light and air, consequently ventilation is necessary, and our open bush-houses suit most kinds admirably, provided the plants are not placed in draughty positions. Even the varieties that are shade-loving require light, though not direct sunshine, for they will not thrive in a dark corner. All like a moist atmosphere when in a growing state. Their life is sustained by the moisture they obtain from the air, so that the surroundings should always be kept damp when the plants are in full vigour of growth.

In purchasing the imported plants be guided by a friend who has had some experience, or you may import some varieties that require a cool-house treatment, and consequently will not stand our summer temperature. Other varieties will not live in a temperature lower than 40 degs. unless protected by

a hothouse. If not inclined to invest in the latter, it would be better to avoid disappointment by leaving them out of your collection meanwhile. Get your little collection together, observe their habits, and give the plants the prescribed treatment. If they are slow in starting, change their position, and you may get a pleasant surprise. A poultry farmer would meet with little success if he bundled his Buff Orpington fowls into the duck-pond with the Indian Runners, and it is the horse sense that would avoid such a silly mistake that will keep an enthusiastic and interested orchid-grower from failing with his orchid treasures.

[The above has already appeared in the "Brisbane Courier," but we republish it that it may always be at hand to refer to by anyone who may wish to begin the fascinating study of orchids.—Ed. "Q.A.J."]

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.							1907.					
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.
North.													
Bowen	0·69	0·04	0·36	3·41	1·76	0·99	11·01	2·53	3·74	1·97	0·39	3·46	2·87
Cairns	3·44	2·28	1·79	1·57	0·56	13·26	11·31	18·36	11·49	3·26	3·35	8 65	4·45
Geraldton	16·05	5·73	6·65	4·26	2·28	21·08	21·20	29·58	25·26	4·58	6·08	21·91	8·54
Herberton	1·04	0·59	0·55	0·38	0·30	5·16	10·82	10·56	11·77	2·05	0·90	1·57	2·71
Hughenden	Nil	Nil	Nil	0·92	0·61	0·51	4·76	1·98	3·83	1·17	0·16	1·34	0·95
Kamerunga State Nurs.	3·55	2·49	2·03	2·56	0·72	10·00	8·17	15·78	14·82	4·87	2·80	9·33	5·29
Longreach	Nil	0·11	Nil	4·11	2·16	0·66	0·51	1·22	0·49	1·88	0·85	0·93	0·40
Lucinda	3·02	0·40	...	Nil	1·85	6·60	*22·36	12·38	23·82	4·53	3·92	19·29	†6·34
Mackay	3·85	0·68	0·93	4·35	2·63	1·80	12·93	2·72	6·42	8·01	1·58	*6·09	*5·04
Rockhampton	1·12	Nil	2·61	3·80	1·07	0·46	5·19	4·15	4·42	3·05	0·44	0·94	4·16
Townsville	0·30	Nil	0·46	3·25	1·45	7·74	14·03	12·49	7·75	7·37	1·03	3·11	2·38
South.													
Barcaldine	0·19	0·10	Nil	2·88	2·92	1·33	1·04	3·44	0·43	1·51	0·82	0·34	2·03
Beenleigh	1·47	0·16	2·94	3·47	2·94	1·75	3·98	4·75	3·88	4·17	0·58	4·70	4·92
Biggenden State Farm	1·42	0·48	3·02	5·07	1·19	3·09	4·55	5·77	3·55	10 91	0·34	4·02	5·24
Blackall	0·22	0·48	0·02	4·70	5·86	1·37	1·96	2·30	Nil	2·78	1·69	0·20	*0·36
Brisbane	1·38	0·22	4·21	3·48	3·81	1·07	3·28	2·69	5·23	5·32	0·45	4·75	2·91
Bundaberg	2·01	0·03	1·86	10·90	1·17	0·97	3·85	3·29	3·90	12·81	0·38	3·08	4·49
Caboolture	0·85	0·29	3·02	4·77	4·73	4·26	3·15	2·53	8·03	*9·04	0·78	3·10	4·98
Charleville	0·13	2·34	0·35	4·09	2·66	1·30	3·71	0·85	Nil	2·75	2·29	0·26	0·90
Dalby	0·87	1·58	2·78	2·65	2·96	2·12	5·67	5·60	1·34	3·72	0·20	2·26	2·35
Emerald	0·17	Nil	1·62	4·47	1·55	2·32	1·79	7·36	3·67	7·66	Nil	Nil	2·53
Esk	0·77	0·38	4·51	4·14	2·90	2·45	5·26	2·87	6·79	3·60	0·22	5·42	2·66
Gatton Agric. College	0·60	0·41	3·73	3·54	2·25	2·01	3·45	2·62	6·44	2·71	Nil	2·80	†
Gayndah	0·48	0·22	2·34	5·14	2·25	4·25	2·82	3·00	1·91	6·89	Nil	2·65	3·00
Gindie State Farm ...	0·05	Nil	1·46	4·57	3·20	2·95	1·45	6·13	0·71	10·10	Nil	Nil	*2·29
Goondiwindi	0·98	0·49	4·35	3·33	2·36	2·32	4·04	5·37	1·77	6·51	0·33	1·30	1·09
Gympie	2·26	0·52	3·19	3·97	3·03	4·12	5·32	3·99	6·96	8·93	1·12	3·84	3·77
Ipswich	0·25	0·17	2·59	2·94	2·60	0·71	4·22	2·17	5·38	1·95	0·12	3·43	2·22
Laidley	0·49	0·50	3·26	3·19	2·87	1·78	4·12	2·84	4·50	3·47	Nil	2·99	1·56
Maryborough	2·55	0·15	2·31	6·48	1·22	2·49	4·39	5·52	7·84	10·28	1·25	3·21	*5·71
Nambour	3·68	0·61	4·52	8·94	4·89	3·40	6·74	5·74	12·05	13·30	1·36	4·54	6·96
Nerang	1·98	0·12	3·56	6·42	8·26	2·75	6·33	9·86	6·04	7·83	1·48	7·54	5·08
Roma	1·08	1·65	1·47	4·43	2·37	1·32	4·31	6·32	2·92	1·87	0·42	0·27	2·47
Stanthorpe	0·45	1·44	3·37	4·29	2·90	2·49	4·89	4·33	3·30	5·98	1·68	1·79	2·44
Tambo	0·05	0·67	0·07	5·17	2·85	1·23	1·16	4·74	1·41	3·58	3·69	0·11	0·89
Taroom	0·81	0·60	2·30	4·26	1·70	1·35	5·49	5·16	1·10	1·86	Nil	1·01	3·76
Tewantin	5·68	0·39	4·25	6·37	4·38	2·73	9·53	6·38	15·83	11·45	1·87	7·16	7·61
Texas	0·75	0·90	3·22	2·77	3·42	2·23	1·83	4·69	4·55	6·16	0·65	0·93	1·62
Toowoomba	0·85	1·81	3·63	4·55	2·76	2·65	4·11	3·94	4·00	4·81	0·01	4·61	3·34
Warwick	0·57	1·16	3·85	3·13	2·47	2·99	5·50	3·95	2·52	5·71	0·51	1·58	1·27
Westbrook	0·55	1·67	2·80	3·34	3·41	1·79	1·48	1·79	2·91	5·13	0·02	2·53	2·53

* Compiled from telegraphic reports. † Approximate. † Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

Tropical Industries.

THE SUGAR CROP OF 1906.

From the Government Statistician's Report for 1906 we take the following figures, showing the result of the last year's crushing:—

Taking the five great geographical divisions, it is found that the Wide Bay-Burnett group was the largest producer of sugar last year, returning 38 per cent. of the total output. Of this, 40,841 tons were turned out from Bundaberg-Gin Gin, and 20,032 tons from the Childers-Maryborough-Tiaro. Rockingham had the next largest production—54,520 tons—of which 25,924 tons came from Cairns-Douglas, and 28,566 from Ingham-Mourilyan. Of the Edgecumbe output of 57,607 tons, Mackay contributed 34,338 tons; Ayr, 12,696; and Bowen, 4,573 tons. The southern division of Moreton crushed 332 acres more cane and produced 1,425 tons more sugar in 1906 than in the preceding year.

Of the 1,728,780 tons of cane cut, 674,268 were obtained from Wide Bay-Burnett; 497,966 from Rockingham; 466,090 from Edgecumbe; and 90,136 from Moreton.

The net increase in area crushed in 1906 was 2,101 acres, and the net increase of sugar 31,655 tons.

The average results of the sugar crop in each division and district are given in the following table:—

SUGAR AVERAGES, 1906.

Divisions or Groups and Districts.	Tons of Cane per Acre Crushed.	Tons of Sugar per Acre Crushed.	Tons of Cane per Ton of Sugar.
Rockingham—			
Cairns and Douglas	17·62	1·83	9·63
Ingham and Mourilyan	15·34	1·77	8·69
Total	16·41	1·80	9·13
Edgecumbe—			
Ayr	21·98	2·65	8·31
Bowen	18·97	2·01	9·44
Mackay	15·46	1·67	9·24
Total	16·88	1·87	9·03
Port Curtis—			
Gladstone	15·24	*	*
Total	15·24	*	*
Burnett and Wide Bay—			
Bundaberg and Gin Gin	16·81	1·94	8·65
Childers, Maryborough, and Tiaro ...	22·80	2·08	10·96
Gympie	19·84	†	†
Total	19·20	1·99	9·65
Moreton—			
Logan	17·23	1·45	11·88
Marburg and Rosewood	14·37	1·04	13·87
Maroochy	18·95	1·91	9·93
Nerang	16·46	1·61	10·22
Total	17·67	1·64	10·76
TOTAL STATE	17·61	1·88	9·38

* Crushed in Bundaberg. † Crushed in Maroochy and Maryborough.

CLAIMED AS GROWN AND HARVESTED BY WHITE LABOUR.

Rebate.	Petty Sessions District.	Area Crushed for Sugar.	Weight of Cane Harvested.
		Acres.	Tons.
No. 1 at 5s.	Cairns and Douglas	6,026	108,051
	Ingham and Mourilyan	8,352	135,954
	Total	14,378	244,005
No. 2 at 4s. 8d. ...	Ayr	2,579	54,764
	Bowen	1,968	37,267
	Mackay	15,496	245,749
	Total	20,043	337,780
No. 3 at 4s. 4d. ...	Bundaberg, Gin Gin, Gladstone ...	16,950	291,459
	Childers, Maryborough, Tiaro ...	11,499	262,596
	Total	28,449	554,055
No. 4 at 4s.	Logan	1,773	30,575
	Maroochy and Gympie	2,089	41,020
	Nerang	661	10,879
	Marburg and Rosewood	392	5,633
	Total	4,915	88,107
	Grand Total	67,785	1,223,947

—	1903.		1904.		1905.		1906.	
	Tonnage of Cane.	Amount of Bonus.	Tonnage of Cane.	Amount of Bonus.	Tonnage of Cane.	Amount of Bonus.	Tonnage of Cane.	Amount of Bonus.
		£		£		£		£
1st District	37,660	9,415	32,131	8,002	35,459	8,850	235,346	59,528
2nd ,, ...	106,333	24,811	166,441	38,620	171,967	40,256	331,154	77,268
3rd ,, ...	40,283	8,728	143,421	31,055	217,300	47,105	543,679	117,792
4th ,, ...	37,500	7,500	37,891	7,534	76,184	15,339	87,256	17,450
Total	221,776	50,454	379,884	85,211	500,910	111,550	1,197,435	272,038

Producers claim to have harvested 1,223,947 tons of cane upon which white-labour bounty was payable. The Excise Department has paid upon 1,197,435 tons, a difference of 26,512 tons, equal to 2 per cent. on the former's figure.

From table Lf may be ascertained both the quantity of white-grown cane produced in 1906 and also the area from which it was cut. In Rockingham, or district No. 1 of the Excise Department, 47 per cent. of the acreage and 49 per cent. of the production was white grown; in Edgecumbe, or district No. 2, 73 per cent. of area and 72 per cent. of production; Burnett-Wide Bay, 81 per cent. of area and 82 per cent. of production; and in Moreton, 96 per cent. of area and 98 per cent. of production.

Table Lg shows for each of the last four years the gradually increasing tonnage of cane upon which bounty has been paid, rising from 221,776 tons in 1903 to 1,197,435 tons in 1906.

[The area under cane in 1906 was 133,284 acres, of which 98,194 were crushed. The yield of cane and sugar is shown above.—Ed. "Q.A.J."]

COTTON GROWING.

In a few weeks it will be time to put in the cotton crop, and we hope to see a very much more extended area under cotton this year than was planted last season. Those who had the wisdom to put in a few acres have had no cause to regret doing so, heavy crops and fair prices having rewarded the enterprising grower. Some farmers picked over 1,300 lb. of seed cotton per acre, which was readily sold for over £8. As a farmer at Mackay said, it paid him better than sugar, and gives the farmer the use of the land for another crop of some kind before the season for putting in cotton again comes round. The shortage of the American cotton crop is again causing a rise in price of the raw material, and it is questionable whether sufficient supplies from that source will be at any future time forthcoming to keep the Lancashire mills in full work. Cotton-mills in the Southern States of America are still increasing in size and numbers, hence cotton which once found its way to England is now utilised in the former country. In the West Indies, in Africa, and in other parts of the world every effort is being made to create a cotton industry; yet still Queensland looks on apathetically and continues to make experiments, as if it had not been fully demonstrated many years ago that this State can produce cotton equal to any American cotton. Two years ago the Department of Agriculture assisted the farmers to grow cotton, and the result was 72 bales of first-grade Uplands, 7 bales of second-grade, and 2 bales of Sea Island. This was sold in the Southern States at 6d., 6½d., and 1s. per lb., for the respective classes. Some of the farmers interested realised £17 per acre for cotton which they sold for 1¾d. per lb. in the seed. We strongly urge those who have suitable land to put in, if only two or three acres this spring, as good prices are almost sure to be obtained for the reason above given.

The area on which cotton may be successfully grown in this State covers 150,000 square miles. Wherever cotton has been tried in the dry Western country, it has thriven amazingly. Sea Island cotton finds a congenial home on the North Coast lands, whilst from the Central district to the Darling Downs, and all over the coastal districts of East and West Moreton, Uplands cotton has been and can be grown to any extent. The yield of Uplands ranges from 1,000 lb. to 1,500 lb. of seed cotton per acre, and, as the picking season occurs in the cool autumn and winter months, this work has always been performed by white men, women, and children. In the days when Queensland grew large quantities of cotton, the children earned from 2s. 6d. to 3s. 6d. per day, with very easy hours and at the very light work of picking cotton. The price paid for picking is ½d. per lb., and from 90 to 100 lb. can be picked during an easy day's work.

SISAL FIBRE INDUSTRY.

That the fibre industry is gradually spreading in Queensland is evidenced by the frequent demands which are made for plants, and by the consequent rise in price of the latter. It is estimated that some half-million plants have been already distributed by the Department of Agriculture and Stock and by private planters. We hear that a large quantity of plants lately went by rail to Degilbo, and that an order has been received for sufficient plants for 200 acres elswhere. This means 150,000 plants, the money value of which is £450. Mr. James Wilson, engineer, of Elizabeth street, has already begun the manufacture of sisal-scutching machinery, and the first one, which worked very efficiently, has been sent to the order of a planter in New Guinea. Two gentlemen—Messrs. Seifert and Smith, members of the New Zealand Flax Millers' Association—paid a visit to Major Boyd's plantation, at the Broadwater, and also to Mr. T. H. Wells's, at Farnbro', Childers. There they interested a number of Bundaberg farmers in the matter of the production of sisal hemp, and they stated that the abundance of cheap suitable land

available for the production of this fibre in Queensland, together with the slight cost of cultivation and the simple method of cleaning the leaves in a single swift operation, should go far towards extending this valuable industry, and so render our State a formidable competitor in the world's fibre trade. The New Zealand flax takes as long as sisal to come to maturity, and, when one crop has been taken off, an interval between that and the second crop of four years more occurs. The gummy nature of the leaves necessitates two machines to dress the fibre and put it in marketable condition. Our visitors stated that, whilst the last year's flax crop returned nearly £750,000 to New Zealand, scarcely any of the product could be brought to the same standard of perfection as the sisal which they saw turned out by the Wilson machine.

NOTES ON THE LIME.

Although the lime grows well and bears heavily, especially in North Queensland, the fruit is seldom seen in the Southern fruit markets. The following notes, which we take from the "Quarterly Journal of the Liverpool University Institute of Commercial Research in the Tropics," may possibly prove of interest to citrus fruit-growers, and induce some enterprising grower to enter upon the manufacture of essential oil and the extraction of lime juice:—

The lime is a native of the East Indies, but has been introduced into the West Indies and the warmer parts of America, where it is now extensively cultivated, and into many other tropical regions. In 1750 Rumph described it under the name *Limonellus*. Wight figured it as *Citrus limetta*, and described it as occurring wild in the Nilgherries. *C. limetta* is really a different plant, not the true lime, differing in possessing a sweet juice. The true lime is *Citrus medica*, L., *var. acida*, Brandis.

CONDITIONS NECESSARY FOR CULTIVATION.

It is cultivated widely in the tropics, but is very sensitive to low temperatures, and is hence not successful in all orange-growing districts. At Montserrat, where the lime grows well, the mean annual temperature is about 78 degrees Fahr., and the rainfall about 59 inches, and these appear to be the most suitable conditions. The best crops are gathered in years during which the rainfall is heaviest. A rich soil is not necessary, as it will flourish in rocky or stony soils, and on land too poor for orange cultivation. It has been suggested that limes might be grown with profit on the poorer soils in cocoa districts. It succeeds best in a light loam, at an elevation from sea-level up to 500 feet near the sea.

DIFFERENT VARIETIES.

Through prolonged cultivation, several more or less distinct varieties have originated. In India there are several named varieties. In America, the West Indies, and Hawaii the commonest type is the Mexican or West Indian lime, of which there are many forms. Other varieties are the Persian and the Tahiti limes, the latter largely cultivated in Florida. It bears a large fruit with lemon-yellow rind, and good quality of juice, and has few or no seeds, but the fruit is said to have a tendency to decay on the trees. This variety is not successful in California.

PROPAGATION.

The trees are usually propagated by means of seeds. By this method, however, it is impossible to ensure the production of exactly the same type as the parent. It is true uniformity of shape, colour, and size are not always essential, but there is at the present time a demand for the finer varieties, particularly in the United States. Uniformity can generally be assured by budding, and this method has been used successfully.

SOWING AND TRANSPLANTING.

The seeds should be sown in nursery beds, pricked out into other beds, and when they have well grown they should be finally transplanted to their permanent positions, at a distance of 15 to 18 feet apart. In Montserrat they are usually planted at 18 feet apart.

CARE OF TREES.

The trees require regular pruning to prevent choking of the centre and to remove suckers. They must also be kept free from parasitic growths such as *Loranthus*, to which the tree is liable. The soil round the tree should be kept free from weeds.

MATURITY AND LENGTH OF LIFE.

The trees begin to bear after three to five years, but are not in full-bearing condition until they are six or seven years of age. The average life of the tree seems to be about thirty-five years.

HARVESTING AND SHIPMENT.

In Montserrat the lime bears fruit freely throughout the year, but the heaviest yield is from September to January, when the crop is often so large that the branches are weighed down to the ground. The fruit is usually allowed to fall to the ground when ripe. It is then piled up into heaps under the trees. In wet weather the limes must be carefully washed to remove the mud adhering to them. Some unripe green limes are exported, but the large majority are allowed to ripen. These may be sent out pickled in brine, or may be treated in the plantation for extraction of essential oil and juice.

EXTRACTION OF OILS.

After washing, the first step is to obtain the essential oil from the rinds. For this purpose an apparatus termed an "écuelle" is generally employed. This is a saucer-shaped dish of copper about 8 inches in diameter and 1½ inches in depth, with a lip on one side. The inner surface is studded with copper projections. The handle is placed below in the centre of the dish and is hollow, serving as an outlet for the oil. The limes are rubbed by hand on the projections of the interior of the écuelle, and the extracted oil runs down the inside of the handle, and is collected. It is then filtered and shipped. Oil of limes is obtained by distillation of the raw lime juice, but is not nearly so valuable as the essence just described.

EXTRACTION OF JUICE.

The limes, after having been "écuelled," are thrown into a machine for extraction of the juice. Often the first machine only cuts the fruit, and the escaping juice is sent out as the best quality. The cut fruit is then passed between rollers and the rest of the fruit squeezed out. Dr. Nicholls has suggested a form of mill with heavy wooden rollers covered with copper, roughly perforated to grip the limes.

REFINING THE JUICE.

The seeds, pulp, and oil must be separated from the juice. This may conveniently be accomplished by the use of casks with a tap 10 inches from the bottom. The juice is run into the cask and allowed to stand for three or four days. The pulp and seeds settle to the bottom, and the oil floats on the surface. By turning the tap the juice can be separated.

ANOTHER METHOD.

In many cases the fruits, after "écuelling," are passed between gun-metal rollers with teeth of different lengths which simply tear the fruit. The resulting juice is passed through a strainer and run into casks. The remaining pulp is put into bags and pressed to extract the remainder of the juice. The refuse is used as cattle food and also as manure.

PRESERVATION AND CONCENTRATION.

If the juice is to be exported without concentration, the casks must be completely filled to exclude air, and should be stopped up at once. The juice will then remain fresh for many months. When the juice is to be kept for a long time, half an ounce of salicylic acid may be added to every 50 gallons of juice to prevent fermentation. Much of the juice is concentrated before being exported. This is effected by boiling it down to one-eighth to one-twelfth of its volume. Great care must be taken not to burn the juice in the process. The resulting concentrated juice is a liquid of the colour and consistency of treacle. Before deciding to concentrate the juice, it is necessary to consider the supply of fuel. If there are no forests in the neighbourhood of the plantation, quickly-growing trees should be planted at the same time as the limes.

In Montserrat the lime industry is now firmly re-established. In Dominica the industry continues to advance; large shipments of raw and concentrated juice are now made, and there is also an appreciable export in green and pickled limes. The manufacture of citrate of lime in place of concentrated lime juice is now attracting attention, and shipments of this product from both Dominica and Montserrat have been made.—["Annual Colonial Report" on the Leeward Islands, 1905-6.]

WORLD'S PRODUCTION OF RUBBER.

In the "Tropenpflanzer," for February, 1907, Professor Warburg discusses the production of rubber throughout the world. The following is an abstract:—

The total production of rubber has risen fairly steadily from about 53,400 tons in 1889-90 to 68,000 tons in 1905-6, and the consumption has more than kept pace with the supply.

Much more than half of the total world's production of 1905-6 was due to America—namely, about 42,800 tons. Nearly all of this originated in Brazil, which produced 41,000 tons, including rubber exported along the Amazon from Bolivia and Peru. Other South American States total about 1,200 tons of rubber; Bolivia producing 1,100 tons, the greater part of which, however, was exported through Brazil. Central America exported about 400 tons, of which Nicaragua produced 250 tons; Costa Rica, 70 tons; Guatemala, 60 tons; Panama, 15 tons; and Honduras, 5 tons. Mexico's rubber production amounted to no more than 150 to 200 tons.

The export of rubber from the Amazon region increased regularly from 22,216 tons in 1896-7 to 34,852 tons in 1905-6, of which last amount 20,167 tons went to Europe and 14,685 tons to America. Besides this, Brazil exported in the year last mentioned 4,800 tons of Ceara rubber, and about 3,000 tons Mangabeira. The prospects of Guayule rubber in Mexico seem poor, and those of the mistletoe rubber of Venezuela even less prosperous. The Para rubber production of Brazil is increasing at the rate of about 5 per cent. yearly, while the production of Ceara and Mangabeira rubbers has more than doubled in the last five years. The Castilloa rubber production of Mexico and Central America does not yet seem to be increasing.

Of the 23,400 tons of rubber produced in Africa, 4,500 tons came from the Congo Free State, 1,500 tons from French Guinea, 1,250 tons from Angola, 1,000 tons from the Gold Coast, while all the other colonies exported together less than 1,000 tons.

The total production of rubber in Asia (and Polynesia) in the year 1905-6 was only 1,800 tons. Ceylon was responsible for about 200 tons of this; India, Burma, and the Malay Peninsula for about 300 tons each, the rest being produced mostly from the French colonies and the Malay Archipelago. Ceylon exported only 84 tons of plantation Para rubber, but, next year, double this amount will be forthcoming, and the production will go on increasing.

It may be estimated that in ten years the present plantations of Para rubber in Ceylon, Malaya, and other regions will produce 25,000 tons of Para rubber annually; also, presuming that in the future there is a yearly increase of plantations of Para rubber of 10 per cent., and that the Brazilian Para supply continues to increase at the rate of 5 per cent. per annum, there will be a yearly increase in the production of Para rubber of only about 10 per cent. The production of Ceara rubber may be greatly increased in Brazil, and the plantations of this rubber in East Africa may be much extended. The production of Castilloa rubber in Mexico and Central America can only be increased slowly, especially on account of the labour difficulties. The production of Funtumia rubber in Africa may well be greatly extended, whilst that of the wild rubber can hardly increase much on account of the destruction of most wild rubber vines and trees, despite orders to the contrary. Asia and Africa, especially the former, have a great advantage over America in the production of rubber by reason of their cheap and good labour supply. So we may expect to see Asia, instead of America, leading the future world's market in rubber production, whilst Africa will probably retain the second place.—"Agricultural News, Barbados."

NEGLECTED INDUSTRIES.

COCOANUTS AND CACAO.

So long as the Northern canefields continue to be profitable, it seems useless to advocate the establishment of plantations of slower-growing products. But a time will come when outside markets will have to be found for our surplus sugar, and when that happens we at once enter into competition with sugar produced in cheap labour countries. However optimistic we may be as regards the sugar industry, it must be abundantly clear that we shall not be able to compete with any hope of success against countries where the wages for field labourers range from 8s. to 12s. per month. Furthermore, as the older plantations begin to lessen in productive power, the soil must be renovated by manuring, and this necessity for keeping up the productiveness of the land will still further enhance the cost of production. Assuming this view to be correct, would it not be wise to make a move in the direction of new products to take the place of or to be produced in conjunction with sugar? Some sugar-planters are already doing so, and have adopted sisal hemp as an alternative crop. But besides sisal hemp, there are other tropical products which would prove remunerative, such as cocoanuts for the production of copra, cacao, rubber, cotton, vanilla, &c., all of which are in great demand and have a high market value.

A writer in the "Port Douglas and Mossman Record" says, on the subject of cocoanuts and cacao—

"I had eight years' practical experience of tropical agriculture in Samoa among cocoa, cocoanuts, coffee, rubber, and vanilla, and I have come to the conclusion that of these the cultivation of cocoanuts and cocoa are the only suitable pursuits for the agriculturist in North Queensland. The cultivation of cotton, coffee, rubber, sisal hemp, and sugar-cane depend mostly for their existence upon a continual supply of cheap, reliable labour, and, in this respect, neither Queensland or any other part of Australia can compete with the rest of the world. Cultivation of cocoa and cocoanuts depends only on the situation of the land and the conditions of the soil and climate, and, in my opinion, could be grown both successfully and profitably on the coastal lands of North Queensland, even under existing labour conditions. Cocoanut-trees are growing in many parts of this district, but the growers have not sufficient of them to justify their going in for the preparation and exportation of copra. Cocoanut-trees will grow and bear successfully only a certain distance from the sea-coast in loose limey soil, sandy or mudbank, and only in the very

tropics—in Queensland from Cairns north. Cocoanut-trees like to have their roots in the ground-water, and their crown in the seawind. These conditions of soil are not too plentiful in this world, but between Cairns and Port Darwin there must surely be 100,000 acres of coastal land suitable for the cultivation of cocoanut-trees, which, when planted, and the trees in bearing, will bring in more revenue and have a greater commercial value than the product of all the South Sea Islands combined. The process of making copra from the nuts is quite an easy and pleasant task. The ripe nuts which have fallen to the ground are collected every month or two, split with an axe, the kernel removed from the shell by cutting with a knife or lying for a day in the sun or artificially dried in a few hours, and the article is ready for the world's market. One industrious worker can make 2 to 3 cwt. of dry copra in one day, and the price for first-class copra was recently up to £30 per ton in the London and Marseilles market. Copra contains 50 to 70 per cent. oil, which oil is nearly all used in the manufacture of soap. Cocoanut oil contains 50 per cent. less moisture than tallow, and, on that account, obtains 50 per cent. better price than tallow. The world's demand for soap is rapidly increasing year by year, and the supply of tallow and other fats does not increase, so that there should be no fear entertained as to the price of copra dropping. The returns of a cocoanut plantation vary a good deal according to situation, but, in Samoa, Tonga, and other islands, the official average estimate of the value of a cocoanut-tree is 4s. per year gross return, and the value of a tree is considered to be about £1 12s. Eight years generally elapse before the cocoanut-tree is in full-bearing.

"Cocoa (*Cocoa theobroma*) chocolate-tree is the most payable of all tropical industries, wherever it grows and bears successfully. The dry cocoa beans contain 14 per cent. of nitrogen substance, and, on this account, the cocoa-tree requires the very richest of soils, such as the banks of rivers in alluvial valleys, and at the foot of mountain ranges. Hundreds of acres of land suitable for cocoa culture can be found, I believe, on the Daintree River and at Bailey's Creek. Cocoa wants a damp, hot climate, with a temperature never below 60 degrees, and protection from wind and the direct rays of the sun. The cocoa-tree has a lot of enemies—rats, birds, and flying-foxes attack both the ripe pods and the sweet flesh between the beans; while ants, borers, and grubs attack the roots and wood. The scrub fungus (*limomea*) often destroys some trees, but the greatest drawback to cocoa cultivation is the heavy tropical rain, which washes away the nitrogen substance from the soil during the first four to six years when the cocoa-trees bear, and then a full-bearing cocoa plantation takes more nitrogen out of the soil than a wheat crop of 30 bushels. Cocoa-growing is by no means so easy as growing cocoanuts or orange-trees. It requires good practical experience at least for the start, but, were that not the case, other countries would have long ago swamped the world's market. The return of a good bearing cocoa plantation is from 8 to 12 cwt. of dry beans to the acre. The price obtained varies from £60 to £110 per ton. Twelve to eighteen pods give 1 lb. of dry cocoa beans. I have seen as many as 300 cocoa pods on one tree at one time. One man can easily look after 10 acres of land planted with cocoa-trees—weeding, harvesting, and pruning. To the best of my belief, there are hundreds of acres of first-class land on the Daintree River and Bailey's Creek eminently suitable for cocoa-growing. The flooded land would be just the thing; in fact, the settlers on the Daintree River, so far as I know, have tried everything—cattle, horses, pigs, goats, bananas, oranges, coffee, maize, and rice, and a lot of other things; but, one by one, they have deserted their places, so that, to my mind, the introduction of the cocoa and copra industries is the only hope of getting people to settle in, at the very least, that part of the North."

The difficulties in the way of cacao-planting, we must, however, point out, are very serious, and in view of the very probable introduction of a disease which has proved disastrous to cacao in all countries where it is growing, all

reasonable precautions must be taken to avoid such a catastrophe here. Putting aside the fear of the introduction of coffee-leaf disease, there would be little advantage in importing large numbers of trees which would be liable to destruction, after years of anxious care, just when returns would be expected. We think it would be much better to obtain what plants are available at the Kamerunga State Nursery, where it is reasonable to believe that the plants have been raised from healthy seed, and where they have been acclimatised, and so would probably be less liable to disease than imported plants.

As the writer says in concluding his letter—"The Diseases in Plants Act was passed in order to prevent the introduction of insect and other pests by the careless and uncontrolled importation of diseased plants and fruits." That is so, and the Act is administered by the Department in such a way as to interfere as little as possible with local enterprise. At the same time, it should be recognised that it is better to "go slow" in establishing certain agricultural industries, than to act incautiously and by rushing them bring disaster upon the enterprising planter.

CANE CUTTING AND LOADING MACHINERY.

We learn from a Northern journal that, in response to an invitation issued by Mr. T. W. Walker, who has had considerable experience in cane harvesting (says a Bundaberg paper), a large number of sugar-growers assembled at the Council Chambers recently to inspect the plans of a cane cutting and loading device, patented conjointly by Messrs. R. H. Paul, of Brisbane, and T. W. Walker, of Bundaberg. The latter explained the principle at some length, after which Mr. H. Young agreed to take up 500 shares. Messrs. Gibson and Howes will also take a similar number. Dr. Maxwell has taken 100 shares at 10s. The general opinion is that the principle of the invention contains the elements of the solution of what is a most important problem to cane-growers.

[The fact that planters of experience and high standing have shown their faith in the machine, after merely inspecting the plans, says a great deal for their probable usefulness. Should the cane-cutter perform its work satisfactorily, the planters using it will be saved the very heavy expense which the work of cutting cane by hand now entails.—Ed. "Q.A.J."]

COAGULATION OF PARA LATEX.

The following information on the coagulation of the latex from Para rubber-trees is abstracted by the "Agricultural News" from the lectures on the subject delivered at the Ceylon Rubber Exhibition:—

Fresh latex is nearly neutral or slightly alkaline. When acidified, coagulation takes place throughout the latex, whilst the rubber slowly contracts and rises to the surface as a white mass. When washed, pressed, and dried, it contains 95 to 96 per cent. of caoutchouc, and has a specific gravity of ·92 to ·96. When fresh latex is allowed to ferment, bacterial decomposition produces acids which bring about its coagulation. If formalin is added in sufficient quantity, its antiseptic properties prevent fermentation. In this case the latex may be kept at least some weeks without coagulating or spoiling. If sufficient ammonia is added to fresh latex, it neutralises the acids produced during decomposition, and the latex can be kept without coagulating, but possibly some chemical changes may take place. Samples of latex, preserved for two months in London by means of formalin, coagulated directly an acid was added, and produced excellent biscuits. The only perceptible chemical change in the latex was a slight generation of sulphuretted hydrogen.

RAMIE IN INDIA.

"Capital," the well-known business paper at Calcutta, recently announced that the Indian Rhea Fibre Syndicate had come to terms with Mr. H. C. Bennerty for the use of his process by which he is said to decorticate and degum rhea without the use of any special patent machinery. The proprietors of "Capital" have courteously furnished this office with a sample of the fibre said to have been treated only by hand, and this sample may be seen by persons interested either as traders or as planters. We understand that the syndicate are now moving planters to cultivate rhea on the lines repeatedly recommended in the "Indian Trade Journal"—that is to say, not in scattered patches, but in such quantity at any one place as will afford to traders some guarantee of adequate and constant supply. Certainly until this is done the fibre can scarcely be said to have come commercially into existence, even of a tentative kind.—"Indian Trade Journal."

NOTES FROM THE SUGAR DISTRICTS.

CHILDERS.

The whole of the Childers district presents a delightful appearance, and, looking from the township, nothing but field on field of sugar-cane is to be seen as far as the eye can reach. There are almost in a compact block 12,000 acres of cane, and the mills will begin the work of converting it into sugar during the next week or two. It is estimated that this will yield over a quarter of a million tons of cane, worth about £1 per ton, so it will readily be seen that the district is a rich and busy one.

HERBERT RIVER.

The area under cane in the Herbert River district totals nearly 10,000 acres, which is estimated to yield approximately 145,000 tons of cane. Of this about 128,000 tons has been grown under white conditions, and 17,000 by coloured labour. It is estimated that the output of sugar by local mills for the year will total about 16,000 tons.

MACKAY.

The Racecourse Central Mill (Mackay) is the first central mill to get free of its liabilities, and to obtain a release for the same from the Government. To commemorate the event a picnic and dance was given by the directors on 26th June.

DOES COFFEE-GROWING PAY?

The answer to this question must be in the affirmative. This being granted, the next and most natural question is: Why do so few farmers, especially in North Queensland, take up coffee-growing, not as their only crop, but as subsidiary to a main crop? Is it because other crops pay better, or because they are deterred by the supposed scientific methods adopted in rearing the plants? No doubt every agriculturist will agree that the quicker a crop can be raised the sooner it can be put on the market, and the less handling required to put it in marketable condition the better it will pay. There are some crops which can be sold straight from the field, such as sugar-cane, potatoes and root crops, lucerne and oaten hay, &c. Others, again, require a certain amount of preparation before they can be sold. Grain crops, for instance, rubber, tea, coffee, cacao, all fibre plants, &c. Sugar-cane has to be crushed, but the farmer has nothing to do with that. All he has to do is to grow the cane, and cut it at maturity, when it is a saleable commodity. Now, it is the same with coffee. When the berries are picked, they can be taken to the State pulper at Kamerunga, and there they are reduced to a marketable article, when the farmer has nothing more to do with it except

receiving the value of his crop when sold. As far as growing the coffee-trees is concerned, there is no more difficulty about it than there is in growing orange or apple trees. Furthermore, wherever frost is absent, coffee will thrive, given, of course, a reasonably good soil and rainfall. Some of the best coffee in Queensland is grown at the Buderim Mountain, in the Maroochie district, and from one end of the State to the other the plant thrives luxuriantly on the warm coast lands.

Let us next consider the prices at which coffee can be sold, and the cost of production. On these points Mr. H. Newport, Instructor in Tropical Agriculture, wrote in an article in the Journal of December, 1901 :—

"It is difficult to arrive at the cost of producing coffee in Queensland, but it is a great deal more than it ought to be. To get proper statistics on the industry, it must first be firmly established; and, secondly, well-organised and exact accounts must be kept by the growers. . . . In Queensland the industry is still young, and in very few instances are accounts kept at all. . . I can say that coffee ought not to cost more than 4d. per lb. (in parchment) to produce here. . . . I do not think coffee can be, or ever will be, produced at 2½d. to 3d. per lb., as American coffee is, but we have in our favour the protective tariff and the quality of the article."

Mr. Newport goes on to point out that Santos, Mexican, and American coffees are low grade, and fetch a very low price in bulk. The Jamaican coffee is packed in bags containing such things as pumpkins, a pair of baby's shoes, a chisel, a hammer head, empty tins, old boots, &c., &c., all the result of gross carelessness. Things were so bad there, said Mr. de Mercado, who is here quoted, that he dared not send away coffee without repacking. Another important point is the cost of transport, in which Brazil, owing to her enormous output, has a great advantage.

Mr. F. Hepburn, who grew coffee on the Hambledon Estate, near Cairns, set down the cost of picking at ½d. per lb. of cherry. At this rate the dry parchment would cost under 2½d. per lb., and when milled—parchment and silver skin removed—the cost is brought up to 3d. per lb. on the commercial coffee-bean.

Some planters, says Mr. Hepburn, plant 1,000 trees per acre, and he gives the average production at 2 lb. of parchment-cured coffee per tree. From this it is to be deduced that at 7d. per lb., the price obtained by Mr. R. D. Lewis, Cairns, for his parchment coffee, each tree would yield 1s. 2d., or at the rate of £58 6s. 8d. per acre. The cost of production, irrespective of planting and care of trees, thus amounts to 5d. per tree, leaving a profit of 9d. per tree, from which to deduct working expenses up to the time of harvesting the crop.

These figures are, of course, of old date, and we have not at hand any very late similar particulars from Mr. Newport. The latter puts the cost of picking, however, at ¼d. per lb.

In a later article (1900) Mr. Newport says that "in Queensland we have a very possible (and frequently reached) 20 cwt. per acre, a probable 15 to 16 cwt. as an average, and an easy and ordinary 10 to 12 cwt. per acre, with very little attempt at cultivation. . . . Now, as to paying: Picking a 10-acre block, giving 10 cwt. or 5 tons means some 15 tons of cherry, which, spread over three months or so, would keep two men or boys hard at it. This 5 tons off 10 acres, if sold at £50 per ton (I am purposely quoting figures so low that even the most pessimistic cannot cavil at on the score of over-sanguineness), would give a gross income of £250. Deducting, say, £2 per week for the owner's living, a balance of about £150 remains out of which to pay for the two helping hands for a few months, transport of crop to town, and interest on or part repayment of the initial cost spread over the first three or four years—surely a fair margin. It will thus be seen that, whilst coffee is practically an impossibility as an industry for a large capitalist with thousands of acres, it undoubtedly offers a very comfortable living for the working farmer, precisely as was, is, and will be to a still greater extent, in the case of small areas of cotton.

THE RATIONAL CULTIVATION OF TOBACCO.

The Italian Minister of Finance has lately published a pamphlet entitled "The Cross-breeding (hybridisation) of Tobacco," in which are embodied the practical studies of the experimental institute of Scafati. In connection with this pamphlet Mr. Vincenzo Fedele says—

We know that of late years the cultivation of tobacco in Italy has assumed an importance which is ever increasing. The last campaign was very characteristic from this point of view. We see that 6,000 hectares (14,826 acres) were devoted to this crop. This is a proof of the effect of the encouragement given by the Government, in the form of prizes of different values, and of the important advantages connected with the cultivation of tobacco. It is furthermore estimated that the approaching campaign will show a still greater development.

The soil, in Italy generally, is well adapted to tobacco cultivation, and this fact decided agriculturists to devote themselves to the acclimatisaton of new varieties, which have been well spoken of for the advantage of the industry, and for increasing the yield. It is hoped that, by this means, Italy will no longer require to import foreign tobaccos. In addition to which it is expected that the cultivation of the leaf in the kingdom will become such as to admit of the exportation of the tobacco to those very countries from which she is at present obliged to draw her supplies. To attain this end more certainly, the Government has set its hand to the work of improving the varieties of tobacco grown in the kingdom by judicious cross-breeding.

Experiments in this direction have been made by Dr. Angeloni at the Institute of Scafati. This practitioner has asserted that the solution of the problem of effecting a transformation of the indigenous Italian tobaccos depends entirely on crossing the cultivated species actually in the country. The experiments which have been made have clearly demonstrated the possibility of attaining the object sought.

These conclusive experiments were based on the crossing of the indigenous varieties—Cuchetto, Spadone, Moro di Coro—with the exotic species, Kentucky, Havana, and Sumatra. The Kentucky and the Spadone are large-leaved varieties. Their leaves, however, do not possess the very characteristic aroma which distinguishes the Sumatra and the Havana.

In experimenting with these crosses, the object principally in view was to produce a variety of leaf of large size, combined with aroma. This object was successfully attained. The hybrid Italia, produced by crossing the Kentucky with the Sumatra, furnished the solution of the problem.

"The Italia," says Dr. Angeloni, "is a plant of splendid appearance; its surprising dimensions ally it to decorative forms, and place it in the first rank of hybrids produced in Italy. In height it measures 1 m. 80 (5 feet $10\frac{9}{10}$ inches), and in volume 1 m. 45 (4 feet $8\frac{9}{10}$ inches). The average number of leaves is twenty-five, of the following dimensions: Average leaves, 84 c. by 56 c. (33 inches by 22 inches); the largest leaves, 90 c. by 58 c. ($35\frac{3}{10}$ inches by $22\frac{7}{10}$ inches).

"It is an early variety, and gives a very large return, up to 30 quintals (6,613 lb.) of good leaves per hectare (2·471 acres). The texture of the leaf is fine, and to this advantage may be added two other very valuable qualities, the required aroma, and combustibility.

"The Italia ranks first amongst the products of our hybridised plants. It is not the only one, for we include a large number of other crosses, each possessing very desirable qualities. We may now assert with confidence that the problem given to our scientists has been resolved in principle, and that the goal aimed at may be considered as attained.

"The results obtained by the Scafati Institute have attracted the attention of all Italian agriculturists, and they are the object of an active propaganda on the part of the Government."

The above interesting article we have taken from the "Bulletin de l'office du Gouvernement Général de l'Algérie" of 15th April.

FIBRE PRODUCTION IN QUEENSLAND.

The "Bundaberg Mail" of 26th June publishes the following remarks and interview with two visitors from New Zealand on the subject of sisal-growing in the Burnett district:—

Within the past few years a good deal of attention has been given to discussing the possibilities of fibre production in Queensland, and, in several instances, such discussion has been followed by definite action in the way of planting greater or lesser areas with sisal in this district. On hitherto waste land on the northern slope of the Hummock, running almost from Sir Anthony's Rest to the scrub patch which has served so long as a valuable landmark and guide for mariners bringing vessels through the Burnett Heads, there is to be seen as evidence of Mr. W. G. Farquhar's determination to put to practical test the preachings regarding the profits of fibre cultivation; for within the space mentioned there are several thousands of sisal plants now in a vigorous state of growth. So far as Bundaberg is concerned, we believe this is the most notable instance in which a move has been made in fibre cultivation, though many other agriculturists have a few plants on their holdings, while there are numerous instances in all parts of the district where sisal has shown a disposition to force its presence uninvited, and certainly uncared for, upon our notice; the roadside in practically any drive one may take furnishing evidence here and there of this fact. In truth, there are those who are not without fear, after noting the hardy and persistent growth of sisal under climatic conditions which have led to a denudation of ordinary vegetation, that, unless great care is exercised in its control, it will spread over the country and become as great a pest as prickly pear and the various burrs and other noxious plants which constitute the *bete noir* of agriculturists in all parts of Queensland to-day.

In the great plan of the Universe, however, there is nothing in either the vegetable, animal, or mineral kingdom that comes under the heading of a waste product; what seems so is but evidence in matter of man's incapacity as yet to interpret and aptly apply the full list of Nature's bounties. To surrender the spirit of speculation and attend to fact, it is incontestable that in fibre production there is no unsolved problem; equally, there is no fear of plants which produce this staple of commerce becoming a pest. As long as the earth yields its fruits under the dual agency of favouring climatic conditions and skilled attention on the part of the husbandman, there will be demand for fibres, and the more prolific the yield under added favours of Nature and increased intelligence on the part of the farmer, the greater corresponding demand there will be for fibre production to bag and to sew and to rope handle such produce, as well as to provide for the many other uses to which fibre manufactures are applied. And it is interesting to be able to record the fact at this stage that the fibre of the sisal plant holds a commanding place in the world of commerce to-day, its strong points being its great strength, durability, and comparative ease of manufacture.

SISAL IN THE ISIS.

The Isis district, thanks to Mr. T. H. Wells, of Farnbro', has a complete object lesson in sisal production, the enterprise of Mr. Wells having prompted him to take a hand in the pioneering of the industry several years ago. On the quality of the fibre produced he has received exceptionally high tetimony, though, we understand, he has had difficulty in coping with the operation of stripping.

It is, unfortunately, the experience of all pioneers, let the enterprise be what it may, to encounter almost single-handed all the difficulties and set-backs with which the path of new undertakings is strewn, and their efforts not infrequently are made in an atmosphere lacking in sympathy. A conjunction of these forces creates a solid wall of prejudice and doubt, which has to be

forced back, inch by inch, as the elements of success creep into the new enterprise and its profitable aspect is laid bare as an established, unchallengeable fact. Mr. Wells's decision to enter into sisal production on a business-like scale has brought to him the customary disappointments which are ever the associates of the explorers of new fields; not, however, so far as the cultivation of the crop is concerned—that is plain sailing—for, as we have already pointed out, the sisal plant is one of the most assertive of tropical growths, but rather in the handling of it after maturity has been reached, in order to place it on the market, a proposition the small grower would always be saved by disposing of his product to the owners of stripping machines. Recently Mr. Wells introduced one of the latter from the old country, and though the results obtained from it have not, we understand, come up to expectations, it is hoped after certain improvements have been effected that it will efficiently serve the purpose for which it was designed.

New Zealand Fibre Experts.

Whatever the measure of earnestness displayed by Queensland agriculturists as to the possibilities of fibre production in this State, those who are associated with the industry in New Zealand are keenly alert to the advantages we possess in this respect. For many years past New Zealand native flax-producers have taken the world as their market, and have most profitably exported their fibre, which in the aggregate last year reached a value of £740,000. The New Zealand Flax-millers' Association have lately, and especially since the publication of Major Boyd's (the editor of the "Agricultural Journal") report on the possibilities of sisal production in Queensland, given close attention to the prospect of this State becoming a competitor with them in fibre production, and have practically reached the opinion—owing to the higher favour in which sisal hemp stands with manufacturers as compared with native flax hemp, the vastly cheaper conditions under which it can be produced, and the simplicity of the method of treatment—that they cannot hope to toe the mark with us, once our settlers enter upon the cultivation of sisal as a serious business-like proposition.

This was the statement, made practically is as many words, and with no less directness and emphasis than we have employed, made to a representative of the "Mail" a couple of days ago by Messrs. L. Seifert and W. Smith, who are experienced hemp-producers in New Zealand. The first-named is a member of a firm which controls 5,000 acres of land under native flax, from which they turned off about 2,000 tons of dressed fibre last year, or equal to one-twelfth of the total (24,000 tons) production of the colony. Both gentlemen are members of the New Zealand Flax-millers' Association, and their visit to Queensland—reaching its close when we interviewed them—was the outcome of a desire to acquaint themselves by personal investigation and inspection of the nature of the rivalry they might expect to meet in their business from sisal hemp grown and prepared in Queensland.

Queensland's Competition in Fibre Production Feared.

The position disclosed to them by their inquiries, they unhesitatingly stated, is such as to cause them to determine to advise their firms not to expand their interests in the land of the moa in flax-fibre production, as the possibilities of sisal-hemp production in Queensland, and the greater demand that exists for this product, is likely to prove more than they can withstand. Messrs. Siefert and Smith informed us that, of the total native flax-fibre grown in New Zealand last year, all save about 1,000 tons was exported, and realised on the London market £31 per ton—making the total worth of the crop just upon three-quarters of a million sterling. A member of Mr. Seifert's firm, who visited the St. Louis Exhibition a couple of years ago, received pointed evidence that sisal fibre is the great want of manufacturers, for he was assured by one large firm that, while that year they had used 4,000 tons of the New Zealand flax product, their preference was for sisal fibre, of which they purposed using

10,000 tons the following year, drawing the supply principally from Yucaton, in the north of Mexico.

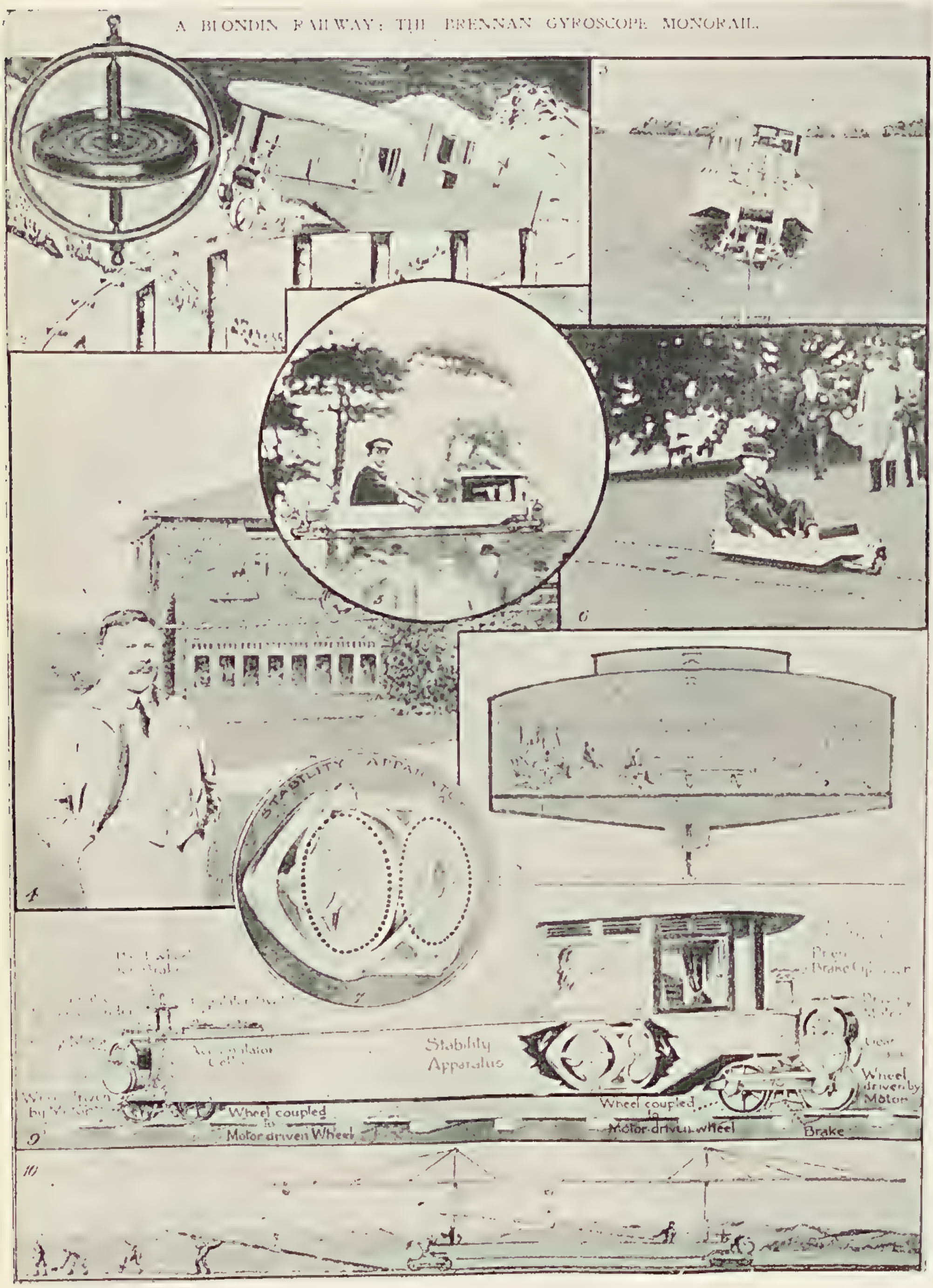
Facts such as these, combined with the valuable information contained in Major Boyd's pamphlet, to which reference has already been made, have caused New Zealand's fibre-producers to turn to Queensland as the country most likely in this part of the world to afford extended scope for sisal cultivation, and the first fruit of this attention is to be found in the visit of Messrs. Seifert and Smith, whose investigations have convinced them that Queensland's competition in fibre production is bound to early become so keen as to rob connection with the native flax industry of much of the profit which has hitherto characterised it. As Mr. Seifert put it: "You have any amount of cheap, suitable land; you are able to work here all the year round; the crop when planted must be much easier of access than is the case with us; while the plant grown under the excellent climatic conditions prevailing here requires much less dressing. With us we require 42 brake horse-power to deal with 2 cwt. per hour, whereas from what I have seen and learned since coming to Queensland it would take less than half an hour to dress the same quantity of sisal grown here.

FEWER TREATMENT PROCESSES.

"The number of treatment processes are less compared with native flax; in fact, to our way of thinking, the treatment of sisal is simplicity itself, comparatively speaking. The New Zealand flax must be stripped under a very severe process, as already exemplified by the power used, and it takes nine men in addition to cope with 2 cwt. per hour. After that," continued Mr. Seifert, "we have to wash it, an operation that requires at least 70 gallons of water per minute, and besides this, the utmost care is necessary to prevent the vegetable matter sticking to or impregnating the fibre, a feature which, if left untouched and unattended to, greatly depreciates the value of the material. This over, we have to 'field' it—that is, spread it out—and, to demonstrate what this means, I may say that in my firm's crop we require an area of about 30 or 40 acres to thus handle our output. The material has then to be left in the field for from ten days to three weeks, according to the weather; then we have to 'scutch' or beat it in order to free it of dust, to take out any brown tails that may be left, and also to straighten the fibre; processes which lead to a loss of about 20 per cent. of the material in tow.

These are all trying and expensive operations, both on the score of cost of labour and resulting wastage, whereas, so far as our inquiries have enabled us to judge, Queensland sisal hemp requires to be submitted to one process only —that is, stripping—and even this solitary process is much easier and less expensive than is the case with flax. After you have stripped the leaves there is nothing else to be done but to sling the product up for a couple of hours to dry. The samples of sisal handed to me as grown in the Brisbane district, and stripped by a machine manufactured in Brisbane, and costing, I am informed, about £50, are not only equal, but superior, to the best hemp produced in New Zealand. In fact, I very much doubt if 5 per cent. of the entire hemp production of our colony comes in quality up to the standard of these samples. All hemp in New Zealand is graded by the Government, and the system has been most helpful in enabling us to build up an export trade." Asked to express an opinion on the possibilities of sisal production in this district, Mr. Seifert said, not only in Bundaberg, but in many places along the North Coast Line, between Brisbane and Rockhampton, there are large areas which appealed to him as specially suitable for the cultivation of the plant. He also said that the area of 40 acres planted by the Government at Bajool, between Gladstone and Rockhampton, is thriving well, and is full of promise of substantial profits. Both gentlemen visited Mr. T. H. Wells, of Farnbro' on Monday, to inspect the sisal crop and treatment plant there, and their impressions will appear in our next issue.

Plate IX.



The Brennan Gyroscope Monorail.

Science.

THE BRENNAN MONO-RAIL SYSTEM.

In April, 1902, we described and illustrated the Caillet Mono-rail system for country roads, &c. Now we have a new and improved system which entirely does away with the permanent way needed under Mr. Caillet's system. This is the invention of Mr. Louis Brennan, C.B., the inventor of the Brennan torpedo.

At the Royal Society's conversazione recently the demonstration easily first in public interest was that of the mono-rail system invented by Mr. Louis Brennan, C.B., the inventor of the Brennan torpedo. In all the systems hitherto worked, however, the cars or wagons travelling upon the single rail either have an arm at their side to take part of the load and prevent them toppling over, or else they travel beneath the rail in much the same manner as in the telpherage system for carrying goods by cable way. Both the Behr and Lartigue systems are upon this principle, and, while they permit high rates of speed, they are open to the objection that the necessary permanent way is comparatively costly and occupies a large amount of space.

The Brennan mono-rail system is of quite a different type, the inventor relying for the equilibrium of the car not upon its speed nor upon the support of the permanent way, but upon an ingenious application of the gyroscopic principle, two gyroscopes revolving at high speed in the car being found to preserve a perfect balance, whether the car is travelling or not, and irrespective of curves and gradients. As a spinning-top preserves its balance while travelling along a cord at a seemingly perilous angle, so the two big tops in the Brennan mono-rail car make it pursue the even tenor of its way when sharp curves are traversed, and sustain its balance when it is stopped at a station.

A single gyroscope would not answer the purpose, but by connecting two gyroscopes by gearing an oscillation or deflection on one side of the line of motion is exactly counteracted by the automatic pressure on the other. Each gyroscope is driven separately, and it will be understood that the gyroscopes are kept rotating when the car is temporarily stopped. When the car is out of service or at a terminal the current for the gyroscopes (it is preferably, if not essentially, an electrical system) is cut off, and the two pediments can then be employed to prop the vehicle.

The gyroscopes, however, rotate in vacuo, and Mr. Brennan explains that the stored-up energy in the fly-wheels, when revolving at full-speed, is so great, and the friction so small, that if the driving current is cut off altogether they will run at sufficient velocity to impart stability to the vehicle for several hours, while it will take from two to three days before they come to rest.—"India Trade Journal."

Our illustrations, for which we are indebted to the "Illustrated London News" for 11th May, show the gyroscope, and its action on the carriage, in various positions.

Chemistry.

ANALYSES OF COMMERCIAL FERTILISERS

TAKEN AND ANALYSED UNDER "*THE FERTILISERS ACT OF* 1905."

Fertiliser.	Where Obtained.	Moisture.	Phosphoric Acid, P_2O_5. Water Soluble.	Phosphoric Acid, P_2O_5. Citrate Soluble.	Phosphoric Acid, P_2O_5. Total.	Potash, K_2O.	Nitrogen, N.	Mechanical Condition. Coarse.	Mechanical Condition. Medium.	Mechanical Condition. Fine.	Remarks.
Simple Fertilisers: Potash Manures.											
		%	%	%	%	%	%	%	%	%	
Potassium chloride	Webster and Co., Ltd., Brisbane ...	·85	...	...	...	60·90	...	...	...	...	
Potassium sulphate	ditto ditto	·43	...	...	...	51·10	...	...	...	...	
Kainite	ditto ditto	·86	...	...	...	14·68	...	...	...	...	
Potassium sulphate	Paul and Gray, Limited	·50	...	...	...	50·82	...	...	...	...	
Simple Fertilisers: Nitrogenous Manures.											
Ammonium sulphate ...	Webster and Co., Ltd., Brisbane ...	2·28	...	...	...	...	19·87	...	...	...	
Sodium nitrate	ditto ditto	2·62	...	...	...	...	15·42	...	...	...	
Bone, Blood, Meat Works Manures.											
Bonemeal	H. Baxter, Maryborough	10·70	...	...	23·55	...	3·68	58·6	18·8	22·6	
Bonemeal	Queensland Meat Export and Agency, Ltd., Brisbane	8·74	...	...	22·48	...	4·02	43·3	30·4	26·3	
Dried blood	ditto ditto	17·50	...	...	1·80	...	12·46	45·1	28·3	26·6	
Ditto	Gladstone Meat Works	12·70	...	...	1·80	...	12·34	79·2	17·9	2·9	
Ditto	Bergl Australian, Ltd., Bowen ...	?	...	...	1·86	...	12·88	...	...	...	

Fertiliser with olood ...	Queensland Meat Export and Agency, Ltd., Brisbane	6·75	...	...	14·28	...	6·27	39·1	29·3	31·6	
Fertiliser	Central Queensland Meat Export Company, Lake's Creek	5·74	...	...	21·99	...	3·15	...	...	100·0	
Ditto	Gladstone Meat Works, Ltd. ...	7·75	...	...	14·73	...	6·02	35·5	27·2	37·3	
Ditto (mixed)	North Queensland Meat Export Company, Alligator Creek	...	...	...	19·50	...	5·44	71·4	9·4	19·2	
	MIXED FERTILISERS, SUPERPHOSPHATES, GUANOS, ETC.										
Superphosphate (Crown brand)	Webster and Co., Ltd., Brisbane ...	21·00	14·76	...	17·92	...	...	...	...	..	
Cereal guano	ditto ditto	17·50	...	...	10·90	2·72	3·12	...	...	...	
Root guano	ditto ditto	14·50	10·40	...	12·82	...	·84	...	...	...	
Star phosphate	ditto ditto	·05	...	11·71	17·01	...	...	72·0	28·0	...	Sol. Wagner's ammon. cit. solu.
Basic slag	ditto ditto	1·17	...	10·50	11·28	...	...	78·0	22·0	...	
Shirley's superphosphate ...	Paul and Gray, Limited	5·57	17·01	...	19·21	...	...	...	...	...	
Shirley's fertiliser, No. 3 ...	ditto ditto	6·56	14·56	...	15·82	2·06	2·97	...	...	...	N as ammonia salt.
Ditto No. 5 ...	ditto ditto	6·44	13·50	...	13·67	6·56	3·19	...	...	...	ditto
Ditto No. 9 ...	ditto ditto	3·83	7·00	...	7·70	4·90	4·29	...	...	...	ditto
Ditto No. 11 ...	ditto ditto	6·67	10·80	...	11·07	7·28	...	...	...	...	
Superphosphate	Straughan, Walker, and Co. ...	15·29	14·24	...	18·21	...	...	...	...	...	
Superphosphate, S.	Millaquin and Yengarie Sugar Company, Bundaberg	15·15	13·52	...	16·49	9·15	...	...	...	...	
Fertiliser, MX	ditto ditto	13·60	·46	...	5·40	...	7·00	...	...	...	
Ditto MKT	ditto ditto	7·90	1·24	...	12·18	5·32	6·37	...	...	...	
Yates's sol. plant food ...	Burns and Twigg, Rockhampton ...	5·47	12·88	...	13·87	4·68	2·66	..	...	...	

NOTE.—The samples were taken by inspectors under "*The Fertilisers Act of* 1905," and the result of analyses show that the composition of the manures agrees in all cases closely with the guaranteed amounts of phosphoric acid, nitrogen, and potash.

J. C. BRÜNNICH,
Agricultural Chemist.

General Notes

A NATURAL ENEMY OF THE LOCUST.

The "India Trade Journal" says that the discovery is reported in Argentine of a natural enemy of the locust—a locust parasite. Dr. Massini, an Argentine entomologist, says that every locust-killing fly lays from 300 to 500 eggs, depositing one in every locust, the eggs rapidly developing into grubs with fatal consequences to the locust. He recommends the Agricultural Defence Commission of his own country to propagate this effective enemy of the locusts, and, should his laboratory experiments not be misleading, no doubt *Lamosca Langosticida*, as the locust fly is called, will be introduced generally to combat the locust scourge.

[Should scientific investigation confirm the above report, it may be hoped that the introduction of the insect into Queensland would relieve the sugar-planters of the locust pest which is occasionally so destructive in the North.—Ed. "Q.A.J."]

KEEPING FLIES FROM HORSES.

The "Bulletin de l'Office" takes the following remedy against flies from an American publication, emanating from the United States Department of Agriculture, Washington:—

Smear the hair of the animal with a liquid composed of resin, black soap, fish oil, and water in the proportions, respectively, of 8 oz., 9 oz., and 9 oz.; water, two gallons. This may be applied with a brush or as a spray. It is perfectly harmless, and said to have proved most effective in Kansas.

PROTECTION FROM THE FRUIT FLY.

The "Producer's Review" says that a bed of parsley planted in the neighbourhood of fruit trees will attract thousands of fruit flies. So great is the attraction said to be that the flies will not go near the fruit, but lay their eggs among the parsley. This is worthy of a trial. We know that, if cattle infested with ticks are allowed to run in a lucerne field, the ticks abandon the cattle. Why they do so does not appear. Can it be possible that for some occult reason the fruit fly will in like manner abandon the practice of laying eggs in fruit when parsley beds can be found for them?

THEFT OF POULTRY.

Last month we took from the "New Zealand Farmers' Weekly" a paragraph which stated that a pen of Silver Wyandottes, the property of Mr. Geo. Howell, of Brighton Hill Poultry Farm, Wentworthville, New South Wales, had been stolen *en route* to the Hawkesbury College egg-laying competition, and that some worthless birds had been substituted for them, adding that the fraud had not been detected for some time. The statement appears now to be utterly without foundation as far as the Hawkesbury College is concerned. Mr. Howell has informed us that they were stolen between New South Wales and Dookie College, Victoria, and asks us to correct the mistake, which we gladly do, with due apologies to the Hawkesbury College authorities for unintentionally reprinting an erroneous paragraph from a contemporary and presumably well-informed journal. Mr. Howell says:—"As one of the oldest competitors at the college, I can assure you that only the best stock passes the Principal and the Poultry Expert."

WHAT WEEDS SHOULD NOT BE DUG UNDER.

A correspondent of "Garden and Field" writes asking what weeds should not be dug under. Now, this is a very important question, not dealt with in any books of gardening, and, as far as we remember, we have never seen any article on the subject. It is a matter ignored by amateurs, from sheer ignorance of its importance. Weeds when dug under act as a mild form of green manure, and if their seed pods are not ripe there is an end of them. They cannot reproduce themselves. There are, however, on the other hand, weeds which are in no wise killed by being dug under, and in many cases are only stimulated into stronger and more extensive growth by this operation. Such weeds are those which reproduce themselves by means of underground rhizomes—for instance, sorrel and nut grass, which are one mass of undergound rhizomes; others are progapated by means of bulbs, such as oxalis. Then there are those that have tubers, &c. These should, therefore, on no account be dug under. The only means of ridding the garden of them is to dig the ground and carefully go over the soil and remove every trace of their underground roots or bulbs, and destroy them. This work requires a lot of patience, but it is the only effective means of doing good.

The oxalis is a perfect pest in some city gardens around Brisbane—and no wonder! We have often seen amateur gardeners diligently turning this plant under, with the result that the hundreds of little bulbs at the roots of them promptly arise from their grave, and the last state of that garden is worse than the first. Those who see the first sign of this pest in the garden beds or walks should follow the advice given by our contemporary; it is the only remedy.

FERTILISING INGREDIENTS PER POUND.

"Garden and Field" says:—When a farmer dresses his soil with a fertiliser he is simply adding to the soil so many pounds of plant food. Thus, when he top-dresses with a hundredweight of sulphate of ammonia he adds to the soil 27½ lb. of ammonia; similarly with 1 cwt. of nitrate of soda, he supplies 17½ lb. of nitrogen. With 1 cwt. sulphate of potash he supplies about 53 lb. of potash. With 1 cwt. of ordinary superphosphate he gives the crop the benefit of about 30 lb. of soluble phosphate of lime. The farmer is in the habit of buying the different articles at a price per ton, and he may have very little idea what the actual fertilising ingredients cost him per pound. He will find if he calculates them out that he is paying at the present time about the following prices per pound:—

	Costs about—
1 lb. ammonia in sulphate of ammonia	5½d.
Or, as nitrogen	7½d.
1 lb. ammonia, derived from nitrate of soda ...	6½d.
Or, as nitrogen	7d.
1 lb. soluble phosphate of lime in super	1d.
Or, as phosphoric acid...	2d.
1 lb. of phosphate of lime in slag	0¾d.
Or, as phosphoric acid	1½d.
1 lb. potash in kainit and muriate of potash, and a trifle more in sulphate of potash	2d.

AGRICULTURAL COLLEGE OLD BOYS' CLUB.

The following subscriptions have been received since 31st May, 1907:—Gilbert Abraham, Karrabin; William Patrick, Clarendon, Esk; R. H. Bentley, South Brisbane, 5s. each.

A. J. Boyd, Secretary and Treasurer.

SALE OF CARAVONICA COTTON.

Cotton-growers, and particularly those who have planted the Caravonica varieties, will be glad to know that this variety of cotton is greatly appreciated on the continent of Europe. Dr. Thomatis received last month a cable message from his agents at Havre, France, stating that his shipment of cotton had been sold at a price equal to 1s. 3d. per lb. We are not informed whether this cotton was what is known as Caravonica No. 1, 2, or 3, silk or wool cotton, nor whether it was the kidney seed variety. We have, however, been informed by Dr. Thomatis that his cotton on being ginned yielded 50 per cent. of lint. This constitutes a record in lint production. This successful sale should go far towards encouraging cotton-growing all over the State.

CACAO AT PORTO RICO.

In his annual report of operations at the United States Experiment Station at Porto Rico, Mr. D. W. May, special agent in charge, says—

"Some of the varieties of cacao imported from Trinidad and planted in 1903 are now fruiting, but it is difficult to secure sound fruit on account of the pod disease, which it has been impossible to keep in check for lack of available labour for spraying. If this disease can be kept in check without too great expense, there seems no reason why cacao should not be grown here more extensively. The problem to be solved is to determine if picking and burning the diseased pods and spraying can be done so as to make a profit under present conditions."

This report clearly shows how necessary it is for the Department of Agriculture and Stock to be cautious in introducing plants from other countries. Where such importations can be made with absolute safety, there is never any hesitation in making them, but it is only right that people should be protected against themselves in matters of this kind.

PUBLICATION RECEIVED.

Readers of the early issues of the Journal will doubtless remember the excellent articles on various agricultural subjects, so ably written by Mr. Henry A. Tardent, who was at the time the first manager of the Westbrook State Farm, near Toowoomba, and subsequently of the Biggenden State Farm, between Maryborough and Gayndah. Mr. Tardent, whilst being a practical as well as a scientific agriculturist, is also a well-informed and talented writer of great versatility. He has just issued a most interesting and useful pamphlet, entitled "Science as Applied to Agriculture, and other Essays." The latter include "Agricultural Problems of the 20th Century in the Commonwealth," "A Few Reflections on the Conditions of an Australian Literature," and others. An article on "Improved Methods in Maize-growing and Maize Utilisation" is, we hold, the most valuable essay in the book, and it should prove of great service to farmers from the South who are just entering on dairying and general farming in Queensland. Besides the literary matter, there are portraits of Allan Cunningham, the discoverer of the Darling Downs; the late Hon. W. H. Groom, to whom the people of the Downs are indebted for the persistence with which he advocated the close settlement which has taken place in the "Garden of Queensland"; of the Hon. L. E. Groom, M.A., Federal Attorney-General, the worthy son of a worthy father; the Hon. Sir Arthur Morgan, President of the Legislative Council of Queensland; and several other portraits and views in the agricultural districts of the Downs and the Burnett. We congratulate Mr. Tardent on the excellence of the little work, which harmonises with the work he is now engaged on as managing editor of the "Toowoomba Democrat and Downs Agriculturist."

Answers to Correspondents.

PERIODS OF INCUBATION.

Enquirer, Rocklea—

Ordinary fowls require twenty-one days to hatch. Guinea fowls go from twenty-six to twenty-nine days; pea fowls from twenty-eight to thirty days; ducks, twenty-eight days; geese, thirty days; turkeys, twenty-eight days. Aged eggs rarely hatch in the shortest time.

LOSS OF CALVES.

J.B., Bundaberg—

Why write anonymously on such an important matter? As you gave no name, we were unable to give you the necessary instructions by letter. Mr. G. Tucker, veterinary surgeon to the department, wished you to send him a portion of a diseased lung, packed in a tin with dry salt, for examination, and also would like to know the age of the calves. Had this been done, you would have now known the remedy. Is it yet too late?

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JULY. Prices.
Apples, Eating, Local, per packer	4s. 6d. to 8s.
Apples, Cooking, Local, per packer	4s. to 7s. 6d.
Apricots, Local, per packer	...
Bananas, Local, per dozen	...
Bananas, Local, per bunch	6d. to 1s.
Bananas, Fiji, per case	...
Custard Apples, per quarter-case	2s. 6d. to 4s.
Cape Gooseberries, per quart	...
Grapes, per lb.	...
Lemons, Local, per packer	2s. 6d. to 6s.
Mandarins, Local, per packer	2s. 6d. to 4s. 6d.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges, per packer	2s. to 3s.
Papaw Apples, per case	...
Passion Fruit, per quarter-case	...
Peaches, per case	...
Peanuts, per lb.	2½d. to 2¾d.
Pears, Imported, per case	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	4d. to 2s. 4d.
Pineapples (smooth leaf), per dozen	1s. 6d. to 4s.
Plums, quarter-case	...
Quinces, per case	...
Rockmelons, per dozen	...
Rosellas, per bag	1s. to 1s. 3d.
,, per quarter-case	6d. to 9d.
Strawberries, per tray	...
Tomatoes, per quarter-case	1s. 6d. to 2s. 6d.
Watermelons, per dozen	...

SOUTHERN FRUIT MARKET.

Article.	Prices.
Apples, Tasmanian, per case	5s. to 6s. to 7s.
,, Other, per bushel case	3s.
Bananas, Queensland, per double case	10s. to 12s.
,, Fiji, per case	10s. to 12s. 6d.
Chillies, per bushel	...
Grapes, per box	...
Lemons, Ordinary, per gin case	3s. 6d. to 4s.
Loquats, per box	2s. 6d. to 4s.
,, Medium to good, per gin case	...
,, Extra choice ,, ,,	...
Mandarins, per case	3s. to 4s.
Oranges, Queensland, per case	4s. 6d. to 6s.
,, Navels, per case	6s. to 7s. 6d.
Pears, Victorian Vicars, per box	3s. to 5s.
Persimmons, per half-case	2s. 6d. to 4s. 6d.
Pineapples, per double case	5s. to 6s. 6d.
Passion Fruit, per gin case	5s. 6d. to 8s.
Quinces, per gin case	1s. 6d. to 2s. 6d.
Strawberries, per dozen punnets	...
Tomatoes, per gin case	4s.
Watermelons, Queensland, per dozen	...
,, medium	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JULY.

Article.		JULY. Prices.
Bacon (Pineapple)	lb.	6½d. to 8d.
Barley (Malting)	...	...
Bran	ton	£4 7s. 6d. to £4 10s.
Butter, Factory	lb.	1s.
Chaff, Mixed	ton	£4 5s. to £4 15s.
Chaff, Oaten	,,	£4 10s. to £4 15s.
Chaff, Lucerne	,,	£4 15s. to £5 10s.
Chaff, Wheaten	,,	£3 5s.
Cheese	lb.	7d.
Flour	ton	£9.
Hay, Oaten	,,	£5 15s. to £6.
Hay, Lucerne	,,	£3 to £4 15s.
Honey	lb.	1½d. to 2½d.
Maize	bush.	2s. 7½d. to 2s. 9½d.
Oats	,,	3s. 3d.
Pollard	ton	£4 16s. 3d. to £5.
Potatoes	,,	£3 15s. to £5 10s.
Potatoes (Sweet)	,,	...
Pumpkins	,,	...
Wheat, Milling	bush.	2s. 10d.
Wheat, Chick	,,	3s. 3d. to 3s. 9d.
Onions	ton	£4 5s. to £5
Hams	lb.	10½d.
Eggs	doz.	1s. to 1s. 3d.
Fowls	pair	2s. 3d. to 3s. 5d.
Geese	,,	4s. 7d. to 5s.
Ducks, English	,,	2s. 8d. to 3s. 3d.
Ducks, Muscovy	,,	3s. 2d. to 3s. 9d.
Turkeys, Hens	,,	4s. 8d. to 5s. 10d.
Turkeys, Gobblers	,,	9s. 5d. to 13s. 5d.

ENOGGERA SALEYARDS.

Animal.	JUNE. Prices.
Bullocks	£9 10s. to £11 7s. 6d.
Cows	£6 15s. to £8 7s. 6d.
Merino Wethers	21s. 6d.
C.B. ,,	27s. 6d.
Merino Ewes	20s. 3d.
C.B. ,,	21s. 6d.
Lambs	18s. 9d.
Pigs (Baconers)	38s.
,, (Porkers)	32s. 6d.

Farm and Garden Notes for September.

FIELD.—Spring has now arrived, and with it there will be the usual trouble with weeds, especially on carelessly cultivated, uncleaned ground. Therefore, the cultivator, the horse and hand hoe, must be kept vigorously at work to check the weed pests, save the growing crops, and much future labour. Attend to earthing up any crops which may require it. There may possibly occur drying winds and dry weather; still, good showers may be looked for in October, and much useful work may be done during the present month, which will afford a fair prospect of a good return for labour.

Plant out *Agave rigida*, var. *sisalana* (sisal hemp plant), in rows 8 by 8 feet, or 6 by 8 feet apart, according to the richness of the soil. All dry places on the farm, too rocky or poor for ordinary crops, should be planted with this valuable aloe, especially should limestone country be selected for the purpose. If the soil is very poor and the plants very small, it is better to put the latter out into a nursery of good soil, about 1 foot to 18 inches apart. Next year they will be good-sized plants. Keep down tall weeds in the plantation, and do not allow couch grass to grow round the roots. The sisal will do no good if planted in low, wet land, or on a purely sandy soil. It thrives best where there is plenty of lime, potash, and phosphoric acid, all of which can be cheaply supplied if wanting in the soil. Sow cotton—Sea Island near the coast, and Uplands generally. Sow maize, sorghum, imphee, mazzagua, prairie grass, panicum, tobacco, and pumpkins. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, ginger, and canaigre, the latter a bulb yielding a valuable tanning substance. Plant out coffee.

KITCHEN GARDEN.—Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing most kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost, dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and stir the soil in the latter case early next day to prevent caking. Mulching with straw or leaves or litter will be of great benefit as the season gets hotter. It is a good thing to apply a little salt to newly dug beds. It is not exactly known what the action of salt is on the soil, but when it is applied as a top-dressing it tends to check rank growth. A little is excellent for cabbages, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 feet apart and 18 inches between the plants, and the climbing sorts 6 feet each way. Sow cucumbers, melons, marrows, and squashes at once. If they are troubled by the beetle, spray with Paris green or London purple. In cool districts peas, and even some beetroot, may be sown. Set out egg-plants in rows 4 feet apart. Plant out tomatoes, 3½ feet each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory, provided the ground is well worked, kept clean, and that water, manure, and, where required, shade, are provided.

FLOWER GARDEN.—Continue to plant bulbs as directed last month. Protect the plants as much as possible from cold westerly winds, which may still occur, notwithstanding the increasing temperature. Keep a good look-out for slugs. Plant out chrysanthemums, palms, and all kinds of tropical and semi-

tropical plants. If hot weather should ensue after planting, water and shade must be given. Sow dianthus, snapdragon, coleus. Roses will now be in full bloom. Keep them free from aphis, and cut off all spent blooms. This latter work should be done in the case of all flowers. If you wish to save seeds, do not wait for the very last blooms, but allow some of the very best to go to seed. If you have any toads in the garden or bushhouse, encourage them to take up their abode there. They are perfectly harmless in spite of their ugliness, and they destroy an astonishing number of insects injurious to plants. Fill up all vacancies with herbaceous plants. Sow zinnia, galliardia, amaranthus, cockscomb, balsam, sunflower, marigold, cosmos, summer chrysanthemums, coreopsis, portulacca, mesembryanthum, calendula, &c.

Orchard Notes for September.

By ALBERT H. BENSON.

The planting and pruning of all deciduous trees should have been completed even in the coldest districts by the end of August, and during the present month the orchardist should disbud and thumb-prune the young trees as soon as they start out into growth. Judicious thumb-pruning is necessary in order to reduce the number of branches, only those buds being allowed to develop into branches that will be required to form the future head of the tree, all the rest being either removed or, better still, pinched back and converted into spurs which will eventually bear fruit, and which, meanwhile, will produce a tuft of leaves that will tend to strengthen the branch and protect it from sunburn. Spraying should be continued during the month in the case of deciduous trees attacked by fungus diseases, such as the shot-hole fungus or rust of the apricot and the Windsor pear blight of pears, the material used being Bordeaux mixture. Where leaf-eating insects of any kind are troublesome, a little Paris green—1 oz. to 10 gallons—should be added to the Bordeaux mixture, the spraying material being then both an insecticide and fungicide, and two pests are destroyed by the one spraying. Vines that have not been treated for black spot, as described in the Orchard Notes for August, should be treated at once; and vine-planting should be done during the beginning of the month, though if the cuttings have been kept in a cold place planting can be continued all through the month. In planting grape-cuttings, see that the cutting is always planted firmly, and that the soil comes into direct touch with it all round, as, if not, it is very apt to dry out. Plant the cutting with the top eye just on a level with, or rather slightly below, the surface of the ground, not with 6 inches or more of the cutting sticking out of the ground, as the nearer to the ground the main stem of the vine starts the better the vine will be, and the easier will be its subsequent training.

Orange-trees will be in full blossom during the month, and in the earlier districts the young fruit will probably be ready to treat for Maori or rust towards the end of the month. Maori is caused by a very small mite, which begins its attack on the young fruit when it is about the size of a marble, though the injury it causes is seldom noticeable till the fruit begins to ripen. Spraying the trees with a mixture of sulphur and soft soap or with a weak solution of sulphide of soda, or dusting the trees with fine sulphur, will destroy these mites. During the end of the month pineapple and banana suckers may be set out during favourable weather in the earlier districts, but it is not

advisable to plant out too early, as they do not root readily till the soil is thoroughly well warmed Orchards and vineyards should be kept well cultivated during the month, as if there is a dry spring the success of the crop will depend very much on the manner in which the orchard is kept, as the better the orchard is cultivated the longer it will retain the moisture required by the trees for the proper development of their fruit. Quickly-acting manures, such as sulphate of potash, sulphate of ammonia, and superphosphate, can be applied to fruit trees during the month if there is any suitable showery weather, but should not be applied during either a very dry or a very wet spell. Fruit trees should be mulched, and when cow peas are required for mulching they can be planted towards the end of the month.

During the month a careful examination should be made of all fruit to see if any contains larvæ of fruit fly: and if such are found they should be destroyed, as if extreme care is taken during this and the two following months to destroy the larvæ of all fruit flies, whenever and wherever found, this great curse of the fruitgrower would be greatly reduced, as it is on the careful destruction of the earlier broods of flies that the saving of the main crop of fruit will principally depend. Though the first damage caused by the flies is comparatively insignificant, they reproduce themselves so rapidly that a few mature insects in the beginning of the season become many thousands before it closes.

The National Exhibition.

The great exhibition of the Queensland National Association of 1907 may well be remembered with pride by all classes of the community, for it was a "Record" in all respects but one. The one exception was the falling off in the district exhibits. This is the more to be regretted, as it is through these special exhibits that the immense resources of our extended territory, as well as of those of our nearest neighbours on the other side of the border, are brought prominently before the eyes of the world. For it must be remembered that the National Exhibition is not a mere parochial affair, in which Queenslanders alone are interested. The great show attracts visitors from many countries outside of Australasia and New Zealand, and many of these visitors from lands oversea are the very men who are largely interested in the development of all-British industries, and who are most capable of forming a correct estimate of our resources, and through whom also the capital needed for their development may be largely influenced.

The impression left on all our outside visitors after an inspection of the varied products of the State is that in no other portion of the British Empire could these collective exhibits be equalled, and certainly not surpassed. One of our Southern visitors—Mr. Somer, the secretary of the Royal Society of New South Wales—generously admitted that the Queensland National Association's Exhibition surpassed that held at the Sydney Agricultural Society's ground, and those who have visited the Easter show of the Royal Society in the sister State admit that it is one of the greatest functions—if we may so designate the event—in Australia. The point which struck him more particularly was the splendid and attractive manner in which the manifold resources of the State were displayed.

There were only three district exhibits this year, and but for the hustling of some public-spirited men in the Central district there would probably only have been two. Still, the Central district, from Rockhampton to Longreach, made a determined, if tardy, effort to vie with the Wide Bay and Burnett district in despoiling the thrice successful Moreton district of its well-earned laurels. One more victory for Moreton meant the capture of the Ainslie shield. A defeat would have left it yet open to other districts to come in and win. But it was not to be. Moreton scored, and now we are more than surprised to learn that it is the intention of the victorious competitors to rest on their oars and stand out next year.

If this decision be adhered to, it will be greatly to be deplored, for these district exhibits, although, of course, they bring practically before the people of our own and of the neighbouring States the special products of one particular portion of the State, yet they are surely not meant only for the gratification of that particular district, but for the advertising of Queensland as a whole, and, by refraining from showing the infinite variety of products which one district alone can produce, the resources of the State as a whole cannot be adequately represented. Combine the principal districts from Torres Straits to the Tweed, from the Pacific coast to the far-off Western border, and gather together exhibits from all these, set out in order of tropical, sub-tropical, and extremely temperate climates, and a spectacle is presented representative of a State covering nearly 700,000 square miles, such as could not be presented in any other part of the world.

It may be said that there is a certain amount of magnanimity in the decision of the Moreton men, inasmuch as they leave to other districts an opportunity of carrying off first honours. There is something to be said for this view of the case. Still, we cannot but feel that every district throughout the State should put forth its best endeavours to show what its resources are, to display them to the best advantage in the most instructive and impressive manner, and, win or lose, there will always be the satisfactory consciousness

of having done something for the dissemination of a knowledge, or a dissipation of the crass ignorance existing in some quarters, of the grand resources of this "Queenly Colony."

We do not propose to enter into the detail of the numerous exhibits, that being the function of the daily Press throughout the State. We would, however, draw particular attention to the exhibit in the Moreton Court of bacon for export by the Q.M.E. Company. When we have to seek an outside market for any product it is manifestly wise to find out what particular form that article of export shall take in order to be acceptable to the foreign or British buyer, so that it may command the highest price in their markets.

It is undeniable that Queensland manufacturers of pig products thoroughly understand their business, and turn out the article in a first-class manner. The favourite farmer's pig—the Improved Berkshire—is an animal fulfilling (or, up to the present, was supposed to fulfil) all requirements of the British consumer. Now, however, we are confronted with samples of bacon such as the soul of the British buyer loveth. One of the main points, if not the main point, about these sample flitches which the Q.M.E. Company imported for the information of the Queensland exporters is—length of side. It appears now that our otherwise perfect Berkshire is a little bit too short to produce a flitch to command the top price in the British market. That seems to be its only fault. Our scientific pig-breeders are, we should think, quite able to cope with this difficulty, either by judicious crossing or by breeding a longer animal, having all the good characteristics of the Berkshire.

As far as the attendance at the 1907 Exhibition is concerned, it beats the highest record—that of 1906—by 1,000 visitors and £91 in receipts for the opening day. It will, perhaps, be well to place on record in these pages the attendance and receipts on the opening day of each year since 1901—the date of the visit of the Duke of York, now Prince of Wales—

Year.	Attendance.	Receipts. £	s.	d.
1901 ...	... 33,000 ...	... 1,311	18	0
1902 ...	... 28,000 ...	... 1,103	2	3
1903 ...	... 33,000 ...	... 1,378	5	1
1904 ...	... 33,000 ...	... 1,381	4	1
1905 ...	... 40,000 ...	... 1,563	5	1
1906 ...	... 45,000 ...	... 1,786	15	1
1907 ...	... 46,000 ...	... 1,878	0	0

DISTRICT EXHIBITS.

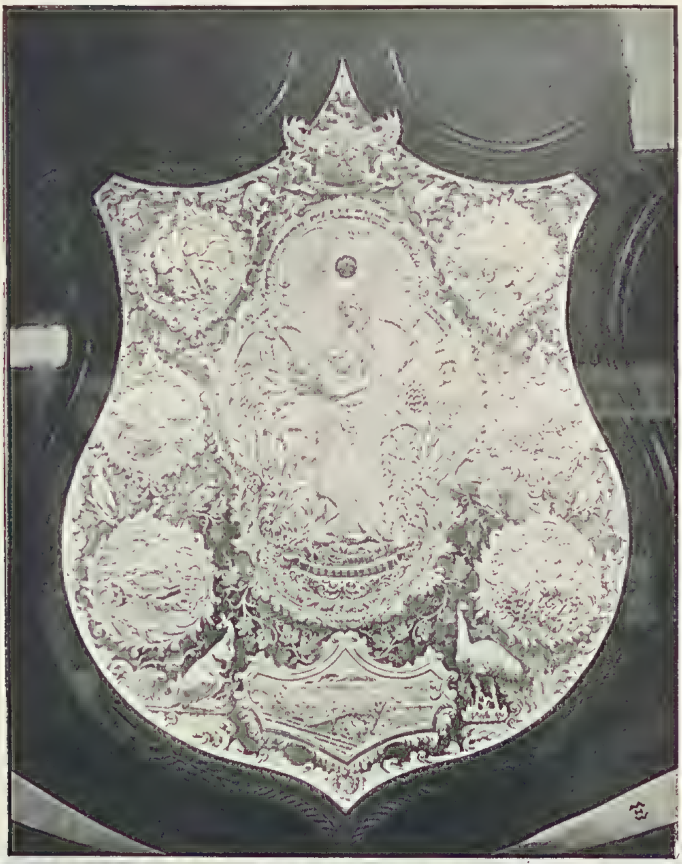
We were, unfortunately, for the first time in the history of the Queensland National Association's Exhibition, debarred from a minute personal inspection of the district exhibits, owing to an attack of the prevailing epidemic of influenza. We were, however, able to spend the afternoon of judging day at the Exhibition, and from what we saw of the three district courts we are quite willing to accept the reports thereon as given by the "Brisbane Courier," as follows:—

MORETON.

Moreton has taken the keenest interest in the district exhibits' display from the beginning, and every credit must be given to the managers for the excellent work they do for the localities in which they reside. It is not only in the displays that they are good, but they excel in artistic display, and that counts points. This year a façade of scoured wool, on pillars of fancy brickwork, makes a striking front to the court, and the name worked in oranges and surrounded by a border of maize stands out in fine relief.

Two of the best trophies in the Exhibition flanked the respective sides of the main entrance—one by the Q.M.E. and A. Company, and the other by J. C. Hutton—both were of hams, bacon, and other cured goods. Included in the Q.M.E. trophy were two sides of bacon imported from England, and shown as

Plate X.



The Moreton District Exhibit.

1. Winners of the First Prize for District Exhibits.
2. The Chelmsford Shield, held by the Moreton District for Twelve Months.

specimens of the kind of flitch the English buyer wants, and alongside as a contrast were two locally cured sides. As an illustration of what to aim at it was excellent, but it possesses the demerit that they were from different breeds of pigs, and growers here have to raise what suits the country best. The tanners and fellmongers' displays were very high class, and covered a very wide variety. L. F. Schoenheimer, M. J. Gallagher, and J. F. Maunsell were the principal exhibitors. Coffee was shown in the raw and manufactured stages by J. Burnett and H. J. Board. Sugar-canes made a nice display, and came from a number of growers about Nambour, but the manufactured sugar and products from the Moreton Mill were not very striking. Cotton made a nice display, the principal exhibitors being Kitchen and Sons, Messrs. Rowland and R. Leitch. Wool and mohair were in, and made up points, but neither can be classed as important industries in the district. The Virginia Brick and Tile Company had an effective display of their goods in great variety. Cornflour was shown by W. Frances, and bottled fruits by Mrs. Rowlinson and Mrs. W. Hartley. Fruits, agricultural products, and vegetables came from various parts of the district, and formed a very worthy collection. There was also a quantity of tinned fruits, prepared by various firms.

WIDE BAY AND BURNETT.

The strongest feature in the Wide Bay and Moreton Court was its sugar exhibits. The cane comprised 110 varieties, including some of the kind known in the Bundaberg district as "Young's," which is said to be the sweetest known in Queensland, and worth 3s. a ton more than ordinary kinds. Then there was a huge stool of 49 stalks, grown by J. Broadhurst on forest land near Childers, and said to be one of the largest stools ever seen anywhere. The growers exhibiting were—J. Broadhurst, Jens Laurisen, Arthur Collins, O. Gahnstron, W. Clark, W. H. Vacher, J. Ruddy, A. Eastaughffe, and R. Denny. In manufactured sugars Millaquin showed seven different varieties of the marketable product, also syrups and molasses. Bingera exhibited four varieties, and Fairymead two. The C.R.S. Company's mill at Childers had a fine, instructive display of sugar in all its stages, starting with raw cane, and giving megass, limestone, raw juice, clarified juice, liquor, molasses, massecate, jelly sugar, and raw sugar. It furnished a splendid object lesson on the various phases of sugar manufacture. The Bundaberg Distillery was represented by rum, white spirit, and methylated spirit. The timbers were also very fine. J. Fairlie and Sons had slabs of beech, hoop pine, cedar, Kauri pine, Flindersia, yellow wood, and silky oak as they came from the breaking-down bench, also joinery. Another interesting display was of scrub timbers, which are suitable for cabinet-work, but hitherto have been burnt as valueless. Sim and Co. showed sawn timber in large sizes; Hyne and Son had samples of pine and hardwood; and Wilson, Hart, and Co. displayed tongued and grooved timber. An inlaid chess table, by F. G. Popp, and a silky oak cabinet, by E. A. Smith, were also in this part. Walkers Limited had manufactured iron and engineering work, and pig lead was shown by the Queensland Smelting Company. In the display of minerals were two nice cut stones—a sapphire and a zircon. These were picked up by school children at South Isis (near Childers), and given to the teacher, who has had them cut, and pretty gems they make. As this district has not hitherto been credited with the production of precious stones, a new interest has been awakened in this. T. H. Wells, who has 50 acres of sisal growing at Childers, contributed some leaves from his plants to the court. The Albion Stove Works and Acme Foundry were also represented; while coal from Burrum and copper ore from Mount Perry helped to swell the collection. Fruits, vegetables, agricultural produce, and domestic products were supplied from various parts of the district. Fish—salted, smoked, and dried—was displayed by T. W. Wilson. Freestone from Booyal held a place, and pottery ware and bricks were contributed by Fisher and Co., Bundaberg, and Meredith and Co., Maryborough. An interesting display also was locally made bicycles and electro-plated ware from the shop of T. Dobbins, Bundaberg.

CENTRAL DISTRICT.

It was only after the recent Rockhampton Carnival that the Central district decided to compete this year. They had abandoned all efforts but the Premier urged them to come along, as a good collection of Queensland products was wanted for England, and he wished the Central district to contribute something towards it. It was then late in the day to enter the lists, and really good work must have been put in to make such a meritorious display. Mount Morgan was a very big factor, and in minerals this court was easily ahead. Gold and copper ores from all the big mines in the district interested those who knew anything about the practical side of mining. Then there was manganese ore from Mount Miller, Gladstone; and coal from the Bluff, Dunstan, and Dawson mines. Precious stones from the gemfields also contributed to make this district very strong from a mineralogical point of view. From the quarries at Marmor some nice specimens of polished marble were shown, and Mount Morgan also put on view bricks, a model furnace, and manufactured clay goods of various kinds. Tinware, copperware, acids, fluxes, castings, blister copper, and plumbers' work helped to show what an immense aid to industries a mine like Mount Morgan was, for all these were made at the works. The Rockhampton City Council engineer showed some ingenuity in manufacturing drain pipes from cement, and some of these were sent down in the collection. Mr. Wilkinson's fine collection of native grasses was also placed in the court. Tobacco in all its stages, from the growing plant to the tobacco fit for pipe and cigarette, were exhibited. Fish from the Keppel Canning Company, including turtle, were shown, either tinned or dried. The Central Meat Export Company also had a nice display of tinned meats. Cotton from the farms of G. Sanderson and W. Lefeldt would make nice trophies, but might have been better displayed. Kapok, both dressed and undressed, were among the miscellaneous exhibits; and there was a very nice display of wool. An exhibit of pineapple fibre by Mrs. Boldeman attracted much attention, and the most prominent other features were—biscuits and lollies by H. Medcraf, cocoanuts from Gracemere, ostrich feathers from Garfield Station, fretwork by the orphans at Meteor Park, a model marine engine by A. J. Gobby, carved cabinet by Mrs. G. P. Allen, skins by W. H. B. May and Co., and saddlery and produce by various exhibitors.

The prize money is allotted as follows:—

	£	s.	d.
Moreton, 387 points	122	8	3
Wide Bay, 373½ points	118	2	10
Central District, 346 points	109	8	11
Total	£350	0	0

SCALE OF POINTS.

The scale of points awarded was as follows:—

—	Maximum Points.	Wide Bay.	Moreton.	Rockhampton.
1. Dairy Produce—				
Butter	25	20	22	16
Milk in any form	...	5	6	5
Cream	10	...	...	...
Cheese	10	6	6	6
Eggs	5	3	4	3
	— 50	— 34	— 38	— 30
2. Foods—				
Hams, bacon, rolled and smoked beef and mutton	10	6	10	7
Small goods and sausages	5	3	5	4
Canned meats	10	0	9	10
Fish—Smoked, preserved, and canned ...	5	4	3	4
Fresh chilled beef, mutton, and pork	10	8	8	6
Hard tallow and oils	5	3	5	3
Honey, &c.	5	3	4	3
Confectionery	5	3	2	5
Frozen or chilled game and poultry	5	4	4	3
	— 60	— 34	— 50	— 45

SCALE OF POINTS—*continued.*

—	Maximum Points.		Wide Bay.		Moreton.		Rock-hampton.	
3. Fruits, Vegetables, and Roots, Fresh and Preserved—								
Fresh fruits, all kinds	10		9		10		6	
Preserved fruits and jams	10		6		9		5	
Fresh vegetables	10		8		9		6	
Preserved and dried vegetables, &c.	10		6		9		4	
Roots all kinds, and their products	7		6		7		4	
Cocoanuts and nuts	3		3		2		3	
Vegetable seeds	5		4		4		4	
		55		42		50		32
4. Grains, &c.—								
Wheat, flour, &c.	20		16		5		4	
Maize, maizena, &c.	12		8		10		7	
Barley, malt, &c.	8		2		2		2	
Oats, rye, rice	5		2		3		2	
Biscuits, bread, cake	5		3		4		5	
		50		31		24		20
5. Manufactures and Trade—								
All wood work	10		10		7		6	
All metal and iron work	10		10		6		8	
Leather, leather work, and tannery	10		7		10		5	
Manufacture, woollen and cotton fibre ...	8		0		4		1	
All tin work	6		4		4		3	
Artificial manures	3		3		3		3	
Brooms and brushes	3		0		0		0	
Manufactures not otherwise enumerated ...	5		4		2		5	
All butchers' by-products	5		5		5		5	
		60		43		41		36
6. Minerals and Building Materials—								
Gold, silver, and precious stones	10		10		1		10	
Coal, iron, minerals, and salt	12		9		5		10	
Stone, bricks, cement, marble, terra cotta ...	8		4		7		8	
Wood, dressed and undressed	10		10		7		7	
		40		33		20		35
7. Tropical Products—								
Sugar-cane	25		25		20		8	
Sugar, raw and refined	5		4		2		0	
Rum, spirits, and by-products	5		5		4		0	
Coffee (raw and manufactured), tea, spice ...	5		4		4		3	
Cotton, raw and by-products	15		10		12		13	
		55		48		42		24
8. Wines—								
Wines	15		12		13		11	
Vinegar and cordials	5		4		4		4	
Aerated and mineral spa water	5		4		4		3	
		25		20		21		18
9. Tobacco—								
Tobacco, raw	15		9		9		10	
Cigars, cigarettes, &c.	5		0		0		0	
		20		9		9		10
10. Hay, Chaff, &c.—								
Oaten, wheat, and lucerne and other crops ...	15		8		10		10	
Grasses and their seeds	10		6		5		9	
Oaten, wheaten, lucerne chaff	10		8		8		8	
Ensilage and other prepared cattle fodder ...	10		7		8		6	
Sorghum and millets	5		3		3		3	
Commercial fibres (raw and manufactured) ...	5		3		4		4	
		55		35		38		40
11. Wools—								
Scoured wool*	18		11		14		18	
Greasy wool	17		10		12		14	
Mohair	5		4		3		3	
		40		25		29		35
12. Schools—								
Best essay on agriculture, to be judged for writing and composition	5		5		4		4½	
Needle knitting work (fine arts)	5		2½		4		3	
School work mats, writing, &c.	5		3		4		4½	
		15		10½		12		12
For effective arrangement of exhibits		15		9		13		9
Total		...		373½		387		346

Minimum of 150 points.

* Wool produced in some other district and fellmongered in the exhibiting district shall be entitled to a maximum of 5 points.

GLEN INNES EXPERIMENTAL FARM.

At the rear of the Rockhampton court was a highly interesting display—that of the Glen Innes Experimental Farm (belonging to the Department of Agriculture, New South Wales). It certainly did credit to the mother State and to the staff and pupils of the farm, for it was exceedingly well arranged, and was effectively displayed. There was a large trophy of cereals—about forty wheats in all—including strong flour and weak flour wheats, Manitobas, macaroni, and Emmer wheats. The varieties that are best suited for the district are John Brown, Jonathan, and Power's Fife (a Manitoba variety). The exhibit of wheat was shown both in sheaves and grain. Then there were samples of smut and rust and take-all in wheat, and in contrast smut or bunt resisters, the best of these being Florence, Dexter, and Jonathan. Allora Spring and Bobs, on the other hand, are very susceptible, and such are treated with bluestone or formalin, lime water being used with the bluestone to counteract the injury done by the bluestone. There were also rust-resisters, chiefly of the Manitoba variety and the Jonathan. Some fine macaroni wheats, recently imported from France, and used for the manufacture of macaroni, and sometimes for mixing with strong flour wheats, were shown, also eighteen varieties of oats, the best being Algerian, which in Algiers thrives on the top of barren hills, and appears likely to prove successful in Australia under similar conditions. In Australia it has yielded 70 bushels to the acre on a large area. It is rust-proof, and a good hay sort. There were also Tartar King and Danish Island (two generally useful sorts). There were seven varieties of skinless barley, including Standwell, Eclipse, Albert, Invincible, and others, the colour of all being very good; and three varieties of rye. There were thirteen varieties of maize, the best being Iowa, Silvermine, Riley's Favourite, and Pride of the North (early-maturing varieties). Maize grain crushed up for stock was also shown, the core being ground up by itself, and forming excellent stock food. In potatoes about fifty varieties were shown, a number of them being imported from Europe and America. Those that give the best yields are —Satisfaction, Royalty, Brownell, Ashleaf Kidney, Northern Star, and British Queen. An interesting exhibit was that of potatoes grown on the top of the ground, under straw; an economical method, at least, of harvesting them, for the straw is simply removed and the potatoes gathered. There were millets, grasses, and sorghums, including the new sorghum, Mazzagua. Among the grasses were—Timothy, *Phalaris commutata* (a frost-resister), and *Schedonorus Hookerianus* (another frost-resister), canary grass, together with pumpkins, melons, squashes, and an interesting exhibit of wool. It embraced the wool of seven pure breeds, the best of which were Lincoln, English Leicester, and Border Leicester; and four crossbreds, including Suffolk-Merino, Shropshire-Merino, and Lincoln-Merino, the latter being regarded as the best of the crosses.

MILKING COMPETITION.

Cow yielding largest quantity of butter fat in 48 hours (Babcock tester). Milking took place at 7 a.m. and 5 p.m. on Wednesday and Thursday respectively, the date of calving being taken into consideration:—

E. Burton's Stumpy, 9 years, calved 17th April, 1906; test, 2·206; allowance for lactation, 1·5; total, 3·706—1.

E. Burton's Silver Belle, 5 years, calved 24th June, 1907; test, 3·497; no allowance for lactation—2.

Samuel Holmes's Florrie, 8 years, calved August, 1907; test, 3·179; no allowance for lactation—3.

Special prize, presented by the proprietors of the "Sydney Mail," for the best milch cow, any breed, subject to a test, and yielding the largest quantity of commercial butter in 48 hours.—E. Burton's Stumpy.

Special prize, presented by Messrs. R. W. Thurlow and Co., Ltd., for cow yielding largest quantity of butter fat in 48 hours (Babcock tester).—E. Burton's Stumpy.

Special prize, presented by Messrs. D. Mackay and Co., for the best milch cow, any breed, subject to a test, and yielding largest quantity commercial butter.—E. Burton's Stumpy.

Special prize, presented by the Silverwood Dairy Factory Company, Limited, for cow (any breed), yielding largest amount of butter fat in four milkings.—E. Burton's Silver Belle.

Special prize, presented by the Lowood Creamery Company, Limited, for cow yielding largest quantity of butter fat in 48 hours; cow to be *bonâ fide* property of a dairy farmer.—E. Burton's Silver Belle.

Cow yielding largest supply of milk in 48 hours, of not less than 3 per cent. of butter fat, subject to result from Babcock tester:—

Samuel Holmes's Florrie, 8 years, 91 lb., 5 oz. of butter.—1.

Dr. R. Macdonald's Queenie, 8 years, 80 lb., 13 oz. of butter.—2.

Patrick Ryan's Tabby, 9 years, 75 lb., 12 oz. of butter.—3.

Special prize, presented by Mr. Rodolph Tudor, under same conditions as in the last class.—Dr. R. Macdonald's Queenie.

National champion butter fat test for special trophy presented by the Brisbane Newspaper Company ("Courier," "Observer," and "Queenslander"), to be won three times by the exhibitor, but not necessarily in succession or by the same exhibit, for cow (any breed) giving the best butter fat results in 48 hours (Babcock test), and which has been the property of the exhibitor three months before date of entry.

Mr. E. Burton's Stumpy won the contest this year, securing the first "leg in."

TABLE OF RESULTS.

The following are the details of the tests as supplied by Mr. R. W. Winks (Government Dairy Expert):—

WEDNESDAY'S MILKING.

	Name of Owner.	Name of Cow.	Lb. of Milk.	Test.	Lb. Commercial Butter.
Morning.	Mr. E. Burton	Silver Belle ...	22·6	3·4	·827
	Dr. R. McDonald ...	Queenie	22·15	2·2	·527
	Mr. P. Ryan	Tabby	20·10	2·8	·618
	S. Holmes	Florrie	25·8	3·0	·823
	E. Burton	Stumpy	12·4	5·3	·759
Evening.	Mr. E. Burton	Silver Belle ...	16·12	4·8	·896
	Dr. R. McDonald ...	Queenie	17·12	3·8	·740
	Mr. P. Ryan	Tabby	18·2	3·3	·648
	S. Holmes	Florrie	19·15	3·6	·777
	E. Burton	Stumpy	9·6	6·1	·645

THURSDAY'S MILKING.

	Name of Owner.	Name of Cow.	Lb. of Milk.	Test.	Lb. Commercial Butter.
Morning.	Mr. E. Burton	Silver Belle ...	22·8	3·8	·938
	Dr. R. McDonald ...	Queenie	21·7	3·0	·692
	Mr. P Ryan	Tabby	23·2	3·0	·746
	S. Holmes	Florrie	24·15	3·0	·805
	E. Burton	Stumpy	11·4	4·7	·588
Evening.	Mr. E. Burton	Silver Belle ...	16·6	4·6	·836
	Dr. R. McDonald ...	Queenie	18·11	3·6	·736
	Mr. P. Ryan	Tabby	17·14	4·0	·788
	S. Holmes	Florrie	20·15	3·4	·774
	E. Burton	Stumpy	6·3	3·2	·214

WEIGHT OF MILK.

	Silver Belle.	Queenie.	Tabby.	Florrie.	Stumpy.
First Day	39·2	40·11	38·12	45·7	22·4
Second Day	38·14	40·2	41·0	45·14	17·7
Totals	78·0	80·13	79·12	9·15	39·11

COMMERCIAL BUTTER.

	Silver Belle.	Queenie.	Tabby.	Florrie.	Stumpy.
First Day	1·723	1·267	1·266	1·600	1·404
Second Day	1·774	1·428	1·534	1·579	·802
Totals	3·497	2·695	2·800	3·179	2·206

NOTE.—Stumpy was allowed 1·5 for lactation; her number of points, therefore, were 3·706.

RESULTS.

For greatest weight of milk: Mr. S. Holmes's Florrie.

For greatest weight of butter:—Mr. E. Burton's Stumpy, 1; Mr. E. Burton's Silver Belle, 2; Mr. S. Holmes's Florrie, 3.

QUEENSLAND AGRICULTURAL COLLEGE AND STATE FARMS' EXHIBITS.

Taken as a whole, the arrangement of the section of the Exhibition Building occupied by the Department of Agriculture and Stock was admirable. The design of the various sections of the court, and the arrangement of the many trophies, the positions of the model silos, and the very beautiful fountain-like device, exhibiting the silvery white fibres of the sisal hemp plant, attracted general attention. Was it by accident or design that the Chelmsford Shield, the precious prize won by the Moreton district exhibits, made its first appearance at the Exhibition on the sisal hemp trophy? *Omen adsit.* The day is, we believe, not far distant when Queensland sisal hemp will figure very largely in our exports. The managers of State Farms and other officials of the Department have now had so much practice in the artistic display of agricultural products that we are not surprised at any new and happy device which they present to our notice.

THE COLLEGE EXHIBITS.

These were strikingly varied, and when we consider that the College has only, so to speak, one climate and a-half, it is surprising how great that variety is. The one climate is on the flats, the half climate on the hill. On that hill the temperature admits of the cultivation of plants which would not do well on the black soil flats—cotton, tobacco, grape vines thrive on the sandy loam on this high ground, thus indicating a warmer temperature than lower down on the lucerne fields and the vegetable garden and orchard near the creek. The exhibits comprised various kinds of grain, fodder, green, dry, and in the form of silage. Cotton was also included. Bacon, hams, and other pig products, all prepared at the College by the students; butter, cheese, honey, dried fruits, seeds, vegetables, hay, trophies of wheat, oats, and barley, and a host of other farm products were not only well displayed, but were all clearly labelled, so that there was no "I-wonder-what-that-stuff-is" heard amongst the crowds of interested visitors. The two model silos in this court were subjected to much inquiry and criticism by farmers who own already or who propose to erect silos. A beautifully finished miniature haystack and a model of an old-world windmill for corn grinding were also much admired.

Amongst the articles shown as the work of the students were horseshoes and several parts of farm implements which had been repaired by them.

The College exhibit, which has always been an excellent one, certainly excelled all its predecessors, so much so that there does not appear to be any room for further improvement at future shows.

THE AGRICULTURAL COLLEGE.

There can be no two opinions as to the value of the instruction imparted to the students at the Gatton College. By the way, Why do people call that institution the Gatton College? Why not Forest Hill or Laidley College? As a matter of fact, it is none of these; it is the Queensland Agricultural College,

Plate XI.

THE QUEENSLAND AGRICULTURAL COLLEGE AND STATE FARM'S EXHIBIT AT BOWEN PARK.—GENERAL VIEW.

Plate XII.

1. Central Trophy of Fodders and Silos at Bowen Park.
2. Sisal Hemp and Cotton Exhibits, Court of the Department of Agriculture and Stock.

and the sooner there are two more established—one in the Central and one in the Northern district—the better will it be for the farming and dairying industries in those districts, provided they are carried on in the same thorough manner which is so pre-eminently characteristic of the Southern institution. We have heard carping, cavilling critics asking why young men who are intended for a farming life should receive instruction in botany, in mathematics, in land-surveying, in chemistry, in geology, &c. A very little sensible thought should suffice to satisfy these critics, who, by the way, are, as a rule, city bred, that the elements of these subjects are of the very greatest value to the modern farmer and dairyman. They might just as well find fault with a student's being taught carpentry, blacksmithing, or fencing. Every farmer should know how to calculate the content of a silo or of a haystack or the volume of a dam. Equally useful is it to him to be able to lay off a field of a given area. A slight knowledge of botany will often suffice to give him the clue to the cause of the sickness or death of his stock in the paddock, without waiting to get an opinion from the Colonial Botanist or from the Stock Department vet. As to carpentering and blacksmithing, every young farmer should know how to use the tools of these trades. He should be able to build his own fences, make his own gates, mend his own drays and implements, and shoe his own horses.

It is just these things which are taught at the College, and not theoretically only.

Mr. Mahon, the practical Principal of our excellent institution, speaking at the annual dinner of the Agricultural College Ex-students' Club on Thursday night (15th August), stated clearly that it was not his object to impart a considerable amount of theoretical knowledge derived from classical works on agriculture, but rather to give a sound, practical education in farm methods suitable for the class of work the student was about to undertake. And this is precisely the plan which is carried out with such great success at the College.

But, not content with condemning a system of which he absolutely knows nothing, the captious critic demands further to know how many of the students on leaving college take up farming? How many are only sent there because they get three years' comfortable—not to say somewhat luxurious—board and lodging for one-third of what it would cost a parent to keep his sons at a boarding school? We can assure our critics—who, by the way, we hope will read this article—that Mr. Mahon is perfectly correct in his statement that 75 per cent. of the lads who during the past nine years had passed through his hands have taken up work in connection with the land. We have a list of a very large number of the ex-students, and they are scattered all over the land, either farming on their own account, farming on shares, dairying, managing dairy farms, creameries, butter factories, &c. Some are on the land in Fiji, a few in New South Wales, and as for Queensland there are few good farming districts from the Tweed to Atherton, as well as in the Western country, where a Gatton College lad is not to be found, and in nearly all cases thriving and building up a future home.

Another statement made by Mr. Mahon is also borne out by experience. There is no instance on record of a Queensland Agricultural College ex-student being given to the degrading vice of drunkenness. One needed only to meet the fifty or sixty healthy-looking young students and ex-students at the Exhibition and at their annual dinner to be satisfied on this point.

We could give a list of the present employment of ex-students, which would show a record of the success of the College system, but we will content ourselves with taking the following notes on the subject, as given in the Brisbane "Courier" of 17th August, under the caption, "What 'Old Boys' are Doing":—

Of the "boys" themselves—and the testimony came from the ex-students—a remarkable number seemed to have been selected for important positions

in dairy factories, posts for which their training eminently fitted them. And in this connection nearly all of the "boys" had gone in for dairying.

One ex-student was appointed agricultural inspector under the Department of Agriculture; another is manager of the Roma State Farm; and another is a cream inspector. A fourth had become manager of the Coraki (New South Wales) Butter Factory. Yet another is manager of the co-operative factory at Rockhampton. In another case an ex-student had become manager of two factories in the Pittsworth district, and one of them, which had never paid, had been turned into a good property through his efforts. He had settled down, and the grounds attached to his house were a model of orderliness and care. In this case the praise and the statement came from another ex-student.

It was related that two other students on leaving the College took up land with a rental of £85 a year, and made so much money that they had since bought farms in the South Coast district, where, Mr. De Burgh Persse assured the Principal, they were the most successful dairymen in the district.

Another case was that of a Cairns lad who was now holding a farm on the shares system in the South Coast district from another ex-student, who had two other farms working on a similar basis. Milking machines were being used.

Another "old boy" had been in charge of the separating work at West Talgai, where a very large number of cows were being milked; but had since taken a farm and let it on the share system.

One of the most remarkable cases related was that of a student who confessed that when he went to the College he did not know a plough from a spade. After three years he took up 1,000 acres of land—320 acres at 2s. 6d. an acre, and the balance at 10s. At the reunions his old colleagues had chaffed him about having gone 23 miles from a railway; but there was not all "green in his eye," he said, as the railway had been extended, and the station was within 20 yards of his gate. His land was valued at £4 an acre, but he would not sell it for £8 or £9 an acre. These were a few of the cases.

The value of the instruction received at the College was most cordially acknowledged, and that the relations between Principal and the students had been most happy was quite apparent.

Reference was made with regret to the fact that there had been no exhibit from ex-students at this year's Exhibition.

It is to be regretted that the idea mooted at the annual general meeting of the Students' Club, held in 1906, at the Offices of the Department of Agriculture and Stock, was not followed up. The idea was that the students should forward an exhibit in the form of a trophy from different districts to the National Association's Show in 1907. The proposal was very favourably discussed, and Mr. Mahon promised a £5 5s. prize for the best exhibit. Every encouragement and assistance would have been afforded to competitors by the Department, as well as by the Principal and the managers of the State farms, and, from the experience gained by the students in assisting to prepare the College exhibits year after year for the National Exhibition, there can be little doubt but that they would have made a most creditable series of exhibits. We trust that they will take up the matter seriously again. They have the whole year before them, and although the exigencies of dairy work, whether on the farm or in the factory, demand the major portion of their time and energies, still we think that for the honour of their *Alma mater* they should, as Mrs. Micawber said, "make an effort."

We understand that the applications for admission to the College are more numerous than there is accommodation for. This is good news, since the greater the difficulty of entering for a three-years' course the greater reason will be shown in course of time for the establishment of the additional colleges we have suggested, or, failing that, for increased accommodation for pupils at the State farms.

Plate XIII.

SILOS AND WHEAT EXHIBITS AT THE NATIONAL ASSOCIATION'S EXHIBITION, BOWEN PARK, DEPARTMENT OF AGRICULTURE AND STOCK.

Plate XIV.

Tropical Products in the Court of the Department of Agriculture and Stock at the National Association's Exhibition at Bowen Park.

One thing should be borne in mind: Agriculture is the foundation of Queensland's prosperity, and it is an old biblical saying that "The King himself is served by the field." Had it not been for the Japanese farmers, General Stoessel would probably still have ruled supreme at Port Arthur.

STATE FARM EXHIBITS.

The object lessons afforded by the exhibits of the various State farms at the National Association's Show year after year, not only lose none of their interest and value as time goes on, but continually add to it. As an instance, we may mention the lesson in pruning which is always so graphically, although silently, explained. Last year His Excellency Lord Chelmsford was very much pleased with it. This year Mr. C. Ross, the manager of Westbrook State Farm, gave over thirty practical illustrations in this manner in grafting and budding, which excited a great amount of interest amongst the number of fruitgrowers who visited the court. Amongst other attractions here was the biggest exhibit of the newly resuscitated Phallaris grass ever seen in the Commonwealth. Specimens of the winter growth of this grass were shown. Plants grown since the 4th June last show particularly the splendid winter growth. To the exhibit were attached placards giving plainly printed extracts from analyses of the grasses made by Mr. J. C. Brünnich, Agricultural Chemist. For purposes of comparison with the canary grass, Mr. Ross showed specimens of Fescues, Rhodes, Paspalum, and other approved grasses for fodder purposes, showing the action on each of the frosts of winter on these grasses, in contradistinction to their effect on the Phallaris. There were, naturally, many inquiries about this wonderful winter and summer grass, and several orders for seed and rootlets were taken.

In connection with the exhibit there is a little history attached to it. Phallaris was originally introduced from America by the municipal council of Toowoomba, many years ago, from Italy, where the grass has its habitat about the foothills of the Alps. Here the climate varies from extreme cold in winter to great heat in summer. But this accommodating grass grows on, sublimely indifferent to such extreme climatic changes. Now, on the Downs, there is a somewhat similar change from great heat to considerably frigid conditions; hence the plant thrives as it does in the Old World.

Now, although Mr. Ross cannot be considered as the introducer of the Phallaris into Queensland, yet he is the reintroducer in a way. The plant was growing in the Municipal Gardens without attracting general attention, when it struck the Curator, Mr. Harding, to exhibit it amongst other grasses at the annual show. There it attracted Mr. Ross's attention. The plant was presented to him. He sowed the seed, carefully tended it, and to-day could sell £3,000 worth of rootlets if he had them.

Small packets of seeds bring from 1s. to 2s. 6d., and the demand is now far in excess of the supply. Mr. Ross recommends planting rootlets rather than seed.

Of the usual agricultural exhibits from the various State farms, we need only say that they are up to the usual excellent standard of those well-managed institutions. Some of the vegetable products, however, deserve more than passing mention, as they are, as far as our experience goes, never seen in shops for sale, either in Warwick, Roma, Toowoomba, or Brisbane. These may be included under the head of blanched vegetables, and comprise endive—a variety of crimpled rather bitter salad, allied to the lettuce—cardoons, asparagus, sea kale, and celery. A most unique exhibit was to be seen in the grapes bottled by Mrs. Ross. These grapes, which are known as the Centennial, are very large, and look very attractive in the bottled form, as do also several other fruits grown last summer and bottled by Mrs. Ross.

The trophies of hay, samples of ensilage, sweet potatoes, maize, and cotton from the Roma State Farm were welcome additions to the attractions of the State farm court.

Agriculture.

MULCHING.

"The reader will find" (says Weathers' "Garden Plants") "this expression used many times in connection with the cultural directions given for various plants. It is, therefore, advisable to explain its meaning and value.

"A 'mulch' or 'mulching,' in gardening language, means an extra covering of soil, rotten leaves, or manure, either separately or combined, placed over the roots of plants, either after the latter have been newly planted or at any period during their growth when it may be considered advisable.

"The advantages of mulching may be summed up as follows:—

"(i.) During the hot and dry summer months it prevents excessive evaporation from the soil, and thus not only preserves the moisture from the roots to absorb, but it also prevents the soil from becoming excessively hot by day and cold by night, thus maintaining a more regular temperature.

"(ii.) In winter it protects the roots from frost, and also keeps the soil warmer.

"(iii.) When a rich mulch is applied to newly planted trees and shrubs, it not only has the above advantages, but the manurial matters contained in it are washed down into the soil, and enrich it with food for the benefit of the newly formed or forming roots.

"(iv.) A good mulching of rich manure to all kinds of fruit trees after they have set their fruits is highly beneficial in assisting them to swell rapidly and ripen more quickly. Once a plant—no matter whether a tree, shrub, or annual—begins to develop fruit and seeds, a demand is made upon its reserve materials. If these are not quite sufficient to meet the demand, it is easy to conceive that the extra food supplied by means of a good mulching will supply the deficiency."

On the subject of winter mulching the "Fruitgrower" remarks:—

"Do winter mulches do harm or good? This may seem a curious question to many readers, but there is so much difference of opinion as to what constitutes a mulch that we are not surprised such a question should be put. Some say winter mulches do harm, that they are cold, or keep the soil cold, and consequently retard growth. Well, that again depends not only upon the nature of the mulch, but the season. What is a mulch? Well, a mulch, broadly speaking, may be made of anything almost, used as a covering around the roots of a bush or tree or on the top of a bed. In summer we put on a mulch to certain crops to keep the roots cool, and that coolness comes from preventing the heat of the sun striking into the soil covered. It retards maturity, and is useful to that end, always provided that mulch is damp and of a lower temperature than the soil itself. Now, with regard to the winter mulch: Does it retard growth and do harm to crops? That, to a very great extent, depends upon the nature of the mulch and the conditions. For instance, a man claims that a winter mulching of stable manure acts as a cold sheet and retards growth, but, at the same time, he fails to see that a mulch of stable manure may not, properly treated, be itself of a lower temperature than the soil. If not, how can it retard growth? Take our mulch; it is composed of stable manure and loam, well mixed. It would never do to say that the application of such a blanket in winter time to the strawberry bed and plant could keep them cold, and thus retard growth. On the contrary, it would protect the rootlets from a very severe and destructive frost, and furnish them with a good supply of plant food at the same time. We claim that the free use of this mulch, made up as it is of short stable manure only and loam, is productive of wonderful results, and especially when put on strawberry beds which are two years old and more. No grower can test this method without seeing that the

improvement in the health of the plants and the size and quantity of the fruits are most marked, and when once used it will never be discarded. We quite agree that to throw on a lot of hard cakes of coarse manure, loaded with straw and general refuse, may retard the growth of an asparagus bed if it is done under certain conditions, but even only then. In winter—that is, when wintry weather prevails—the soil is as cold as it can well be, and whether wet mulch be put on or not will not make any difference. In open weather it is well, naturally, for the air and light to act on the soil; that is why such a mulch, if used, should be removed when the weather is open, to induce early growth."

UNION AMONGST FRENCH FARMERS.

When France paid promptly the enormous war indemnity demanded by Germany, who found the money? Not a few millionaires; not the Government as a Government; but the people as a whole, and none furnished greater contributions than the farmers. How is this? Travel throughout France and you will see vast areas under cultivation by small farmers, each individual holding ranging from 3 acres to 500 acres. Every available inch is cultivated, and every farmer puts away a few francs to be invested in Government securities. The greatest organisation in the world—the farmers' organisation—has for the past twenty years gone quietly and slowly about its work, making fresh strides every year.

Under a law of the Third Republic, of 21st March, 1884, the French farmer—and under that head is included the land-owner, the occupier of the lands, and the agriculturists of every degree—is empowered to organise societies for the economic, industrial, commercial, and agricultural betterment of his class. They are permitted to possess the realty necessary for their meetings, library and lecture-rooms, to establish banks among their members, to provide pensions for the aged, relief funds for the sick and needy, and to open offices for the unemployed. They are empowered to organise tribunals for the settlement of all contentions between workmen or workmen and employers.

Under this law farmers and persons having to do with either the growing or disposing of farm products have combined to the number of 8,501,695, and are comprehended in 7,089 societies. These are the figures for 1st January, 1900.

The farmers' societies combine and organise in a larger body, called a union, of which there are ten in France now—the Northern Union, headquarters in Boulogne; the Normandy Union at Caen; the Breton Agricultural Union, Rennes; the Western Union, Angers; the Burgundy Union, Dijon; the Alpine and Provence Union, Marseilles; the South-western, Bordeaux; the South-eastern, Lyons; and the Union du Midi, Toulouse. Over these is a central body in Paris, to which all unions report, and which represents their interests in the French Legislative body and in the more important matters of business.

The societies are each divided into a number of subordinate groups. The departmental or county union is divided into syndicates, these into cantonal or township unions, and these once again into communal or neighbourhood syndicates. From the highest to the lowest political unit they are all interlinked, harmonious, and independent.

As to the advantages of this vast organisation, they are summed up: The buying by wholesale of fertilisers and farm implements, doing away with all middlemen; the securing of cheap transportation of all the products at one time, thus reaching the most desirable markets in the best time. As to his profit, it is obvious. With the competition destroyed, the poorest farmer is on the same footing as the richest. The prices are never cut. The society always sees to that.

In regard to specific instances where the union has received benefit, it may be mentioned that the syndicates of Brittany and Normandy control the butter market of Paris. Its trains, starting from the smallest of hamlets, rapidly and expeditiously collect the butter, and get it into Paris at small cost. The experience of the apricot-growers of Roquevaire and Lascours is another. In former years the sale of their output hardly paid expenses. Since the union it has flourished. The harvests are all brought to a place agreed upon, and a sales' agent takes charge of them. Children employed by the syndicates remove the stones from the fruit, which sell for from 4s. 9½d. to 7s. 11d. per 220·46 lb. The stones last year weighed 55,000 lb., and were picked by 150 women and children.

The fruit is whitened and packed in hermetically sealed cans for shipment to Belgium, Holland, England, the United States, and South Africa. The output from the one community last year reached 1,000,000 lb. It controlled the market, and prices were secured which brought a profit to everyone.

In every department of agriculture the result is the same. The farmer is rapidly taking charge of the market, and making terms which prove profitable. No one outside a syndicate can compete, because the society has all the advantage. He purchases his supplies cheaper, and in every way out-distances his rivals. This is, of course, known to the farming class as a whole. Six hundred and fifty-six more syndicates were organised in 1900 than in 1889. The number of new ones last year approximated 1,000.

It will be only a question of a few years when every farmer and farm employee of the Republic will be a member of the trust. There will be none to compete with him. He will have a monopoly more complete than any other in the world.

THE VALUE OF HUMUS IN THE SOIL.

The meaning of the word "humus" is decayed vegetable matter. Agricultural chemistry calls it organic matter. Soil is composed of two principal elements—mineral matter and humus. We have all noticed how readily newly cleared forest or prairie ground responds to a crop. This is because the land is rich in humus. After a time, because of constant cropping, the humus is worn out of the soil and it becomes barren in a measure, and particularly it fails to grow a crop in a drouth. The farmer has gone along year after year, taking off crops, and he has not resupplied the soil with decayed vegetable matter or humus.

One very important function of humus is to act like a sponge and hold moisture. To illustrate: Take a tin pan and punch the bottom full of holes, then fill it with coarse sand and turn on a quart of water. It will be seen that a large portion of the water runs readily through the sand and out of the pan. Turn out the sand and fill the pan with dry muck, which is decayed vegetable matter. Turn on a quart of water, and but little of it will run through. As we said, the muck or humus holds the moisture like a sponge.

NITRATE OF SODA FOR CEREALS.

Wheat, unless the soil is decidedly rich, is greatly benefited by this manure, used at the rate of from 1 to 2 cwt. per acre in the spring of the year. If the young plant appears sickly or thin after the winter, this condition is speedily removed by the top-dressing, and a much heavier crop is obtained than would otherwise have been the case. Oats and barley likewise receive benefit. In one case in Scotland the application of 1 cwt. per acre to oats resulted in a yield of 64 bushels per acre, whereas without the nitrate only 36 bushels was obtained upon land of the same description. It will be conceded that, with nitrate at the high price ruling here, such an increase would

leave a handsome profit upon the outlay for the manure. Mangolds require nitrogenous rather than mineral manures, though the latter should not be omitted if the soil is at all poor. A liberal top-dressing of nitrate of soda, especially if used with common salt, will generally secure a good crop of mangolds. A mixture of from 1½ to 2 cwt. of nitrate of soda per acre, with from 2 to 4 cwt. of common salt, is a fair dressing, which should be applied in two sowings, the first taking place when the young plants have got sufficiently forward to make prompt use of the nitrate, some of which might otherwise get washed into the subsoil and be carried off by drainage. Owing to the difficulty experienced in growing the turnips and other crops of the Cruciferous order in this country, in consequence of their liability to be attacked by mould or aphis, there is no doubt that the mangel crop will assume an increasing importance, especially as the dairy industry advances. This being so, it is desirable that farmers should test the efficacy of those manures which are most likely to produce an increased yield of this valuable root.

LAMB-RAISING.

We have frequently advised farmers who have suitable land to go in for raising lambs for the London market, but the old adage about the voice of the charmer appears always to hold good in Queensland. True it is that no man is a prophet in his own country. Perhaps now that Mr. H. Huntington Peak, a Victorian gentleman, largely interested in lamb-raising, who was in Queensland during Exhibition week, has spoken on the subject, a few of the more enlightened farmers, who still put all the eggs in one basket, may be induced to follow Victoria's example in the matter of sheep-breeding for export. Queensland, said Mr. Peak, has a grand opportunity, which she has practically neglected. Five years ago Victoria exported 50,000 lambs, and now exports 654,000 annually, and the lamb-raisers, the farmers, get from 13s. to 15s. per head for them. Last year Queensland exported 20,000. Whether this astounding number will be increased or not when the figures for 1907 are out next year is difficult to say, as we are, unfortunately, so spasmodic in our latest industries that it is usually impossible to predict whether there will be an increase or decrease of exports. Have we not seen this exemplified in the case of such products as rice, coffee, cotton, arrowroot, honey, &c.?

It struck Mr. Peak as very singular that, whilst hundreds were going in for dairying, the lamb-raising business, for which the Darling Downs are so eminently suited, has stood still. And this is all the more remarkable to him since there is nothing like the labour attached to lamb-raising as there is to dairying. As he said to a "Courier" representative: It is the life of a gentleman compared with that of a labourer. Amongst the reasons given for not extending the business, some farmers spoke about worms and parasites. Old colonists will remember the great work done by the late Mr. Haly, a pioneer Darling Downs squatter, in the matter of combating the "worms in sheep" trouble. One of Mr. Haly's specifics against it was reaffirmed by Mr. Peak. He said that the conditions on the Downs are identical with those of South Gippsland, where the industry is carried on with such great success. Lamb-raisers there have learned the need of keeping the grass short and not allowing it to attain the rank growth which induces worms. Consequently they cut up their properties into small paddocks, which are regularly fed down in rotation, and so never allowed to become rank. As to the best breeds for our various districts on the tableland and on the Western plains, he thought that for the Downs Shropshire rams and cross-bred ewes would produce the best lambs.

On the Western plains, such as about Roma, for instance, the big-framed merino ewes and Shropshire rams should do well, but, generally speaking, he says the trade prefers the Shropshire and crossbred as producing the more suitable lamb with most meat and weight. In New Zealand, where they breed

for mutton and not for lambs, the English Leicester is favoured. Exporters already established in the South have told Mr. Peak that they are quite prepared to go into the trade in Queensland if opportunity offered, and they see no fear of overcoming the demand. In the United Kingdom the demand for lambs is only now extending from the cities into the provinces. They are also looking to the European markets, particularly Germany and Austria. Australia is able to fill in what was once practically a "close season" for lambs in the Old World, and Mr. Peak sees in all this a splendid opportunity for the graziers of this State. He thinks that, instead of 20,000 lambs from all Queensland, the Downs alone could export 250,000 per annum, without reference to the other territory within the borders of the State suitable for lamb-raising.

WHEN IS DRAINING NECESSARY?

1. Whenever after rain water remains in the furrows or stump holes.
2. When the soil sticks to your shoes or horses' feet and farm tools.
3. Whenever you see water in the footprints of a horse or other animals.
4. When animals sink deeply into the soil.
5. When the rays of the sun form a hard crust on the soil.
6. Whenever after heavy rain the little holes in the ground show more water in them than in other parts.
7. If after rain a stick is put into the ground and taken out, water will rise in the hole.
8. If crops will grow better when land is gathered up into small ridges.

In the first place, we get rid of the stagnant water, both on the surface and below it. Stagnant water has an injurious effect on vegetation, it is deprived of its oxygen, and while it remains in the soil it prevents fresh water from taking its place. Water held in suspension is detrimental to plant life, and must be kept moving; it also opens the soil and lets the air in after it.

Thus, draining resolves itself into keeping the water moving, to prevent its stagnating and souring the soil. No crops, unless perhaps rice and New Zealand flax, can prosper in water-logged land.

EXPERIMENTS WITH BARLEY.

As a result of experiments with barley conducted by the Yorkshire College authorities in conjunction with the Yorkshire Council for Agricultural Education, the following conclusions are drawn by Professor Seton:—

1. Two and a-half to 3 bushels per acre seem to be a sufficient seeding of barley for both yield and quality.

2. At Garforth the results from "pickling" have, so far, shown that the treatment adopted may be depended upon as a simple and cheap preventive against smut. One pound of bluestone (sulphate of copper) dissolved in 1 gallon of water, and distributed over 1 sack (4 bushels) of seed, was the amount used. It may be that a smaller quantity would be equally efficacious in preventing smut, and, if so, there would then be less risk of injury to the young plant.

3. For medium-class soils in good condition it would seem that an application of about 5 cwt. salt per acre improves the yield, and possibly the quality, of barley.

4. On medium-class soils in only moderate condition artificial manures can be profitably used. For the production of the best yield and quality a "complete" mixture seems necessary. Such a mixture may consist of the following:—

About 1 cwt. sulphate of ammonia, or a corresponding quantity of nitrate of soda, top-dressed some time after the barley is through the ground, 2 cwt. super, 2 cwt. kainit.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Returns from 1st to 31st July, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Pee-wee ...	Holstein-Sh'rth'rn	6 April, 1907	863	3·8	38·36	
Sue ...	Ayrshire-Sh'th'rn	22 April ,,	778	4·2	38·23	
Night ...	Holstein-Devon	29 May ,,	821	3·8	36·50	
Laura ...	Ayrshire ...	20 May ,,	795	3·8	35·34	
Rhoda ...	Grade-Shorthorn	12 Mar. ,,	711	3·8	31·61	
Chocolate ...	Shorthorn ...	5 Mar. ,,	672	3·8	29·87	
Lass ...	Ayrshire ...	19 April ,,	644	3·8	28·63	
Lowla ...	,, ...	25 Mar. ,,	625	3·8	27·78	
Hettie ...	Ayrshire-Sh'th'rn	27 April ,,	620	3·8	27·56	
Dripping ...	Holstein-Sh'rth'rn	28 Nov., 1906	551	4·2	27·07	
Renown ...	Ayrshire ...	27 Mar., 1907	603	3·8	26·81	
Poppie ...	Guernsey-Jersey	24 Feb. ,,	542	4·2	26·63	
Donah ...	Holstein ...	30 May ,,	602	3·8	26·76	
Nettle ...	Shorthorn ...	17 May ,,	665	3·4	26·45	
Blank ...	Jersey-Ayrshire	4 Feb. ,,	535	4·2	26·29	
Maggie ...	Holstein	12 May ,,	613	3·6	25·82	First calf
Kit ...	Shorthorn ...	6 May ,,	588	3·6	24·76	
Dewdrop ...	Holstein	24 Mar. ,,	608	3·4	24·18	First calf
Bee ...	Jersey	27 Dec., 1906	352	5·6	23·06	
Winnie ...	Shorthorn ...	11 Sept. ,,	447	4·4	23·01	
Wonder ...	,, ...	7 Dec. ,,	463	4·0	21·66	
Whitefoot ...	Holstein Sh'rth'rn	7 Nov. ,,	418	4·4	21·51	
Primrose ...	Guernsey-Ayrs'ire	6 May, 1907	522	3·6	21·98	First calf
Cocoa ...	Jersey	13 Dec., 1906	438	4·2	21·52	
Noreen ...	Holstein-Sh'rth'rn	3 Oct. ,,	431	4·2	21·18	
Nambour ...	,, ,,	21 Nov. ,,	473	3·8	21·03	
Count ...	Shorthorn ...	20 Nov. ,,	454	3·8	20·18	

Cows grazed on lucerne for 2½ hours daily, and hand-fed with green barley.

REARING CALVES.

When skim milk is fed to calves, there is a something wanting in it, and that something is the butter taken out of the whole milk in the shape of cream. It follows, therefore, that this loss must be made up by some supplementary feed.

Linseed, oilcake, cotton-seed meal, bran, oats, and peas are all good. Bran is frequently mixed with chopped oats and peas, and fed raw in the milk. That practice is most objectionable, and frequently results in the loss of the full value of the grain fed, besides inflicting injury upon the calf by scouring. The better plan is to put the bran and chopped oats and peas, with ground linseed in a dry state, into a box conveniently placed within the reach of the calf. Between the ages of one and three weeks most calves will begin to eat the mixture. The chewing necessary to comfortable swallowing fits the feed for proper digestion, and prevents all risk of scouring from that cause. The chewing also favours the free flow in the mouth of a good deal of saliva, needed to thoroughly digest the milk gulped down so hurriedly from the feeding pail. Linseed oilcake or cotton-seed meal may be boiled or well scalded and mixed in a syrupy state with the milk. The composition of the additional feed might be about equal parts by bulk of bran, oats, and peas. No fixed quantity per

head for feeding need be mentioned. It has been found desirable to allow the calves to take as much as they care to eat. Handfuls of the best new hay—and all hay for fodder should be cut on the green side—may be offered, and most calves will eat grass with relish at a month old.

Opinions differ as to the relative advantage of keeping calves in the stable all summer and allowing them the run of the small pasture field. A grass plot with no shade from the sun, and where flies are numerous and diligent, is not the best place for calves. But if the calves be kept in a dark, cool stable during the hot days, and turned out for the evenings and nights, the protection of the soiling system will be coupled with the benefits of exercise and feed outside. Some farmers report very satisfactory results from adding turnips or small potatoes, pulped, to the aforementioned grain mixture, from the time the calves are three weeks old. No matter where fed, in the stable or out, each calf should receive only its own share, in its own pail, in its own stall, thus successfully avoiding the respective risks of gorging and starving.

Calves reared in this way will gain in size and strength of constitution all spring, summer, and autumn. When the severe weather of winter comes it finds these calves accustomed to live mainly on grass and dry chopped feed, so that the change to stable and winter conditions of existence is not violent nor very trying. The best conditions for profitable growth having been supplied by the intelligence of the owner, the inherited good qualities of any calf will get fair play. But if good qualities of breed inherited from the best of stock be baulked at the beginning by unsuitable conditions for growth and thrift, all chance of after profit from milking or fattening is gone. The profit of dairymen can be largely augmented by proper attention to the early feeding of young calves.

PREVENTING HORN GROWTH.

Although horns were absolutely necessary to enable wild cattle to protect themselves from their enemies, they are not only useless to domestic cattle but also injurious to the animals themselves. Cattle with horns are excitable —without horns, far less so. Every dairy farmer knows that the quieter his cows are kept, and the less fear and excitement they are subjected to, the greater the yield of milk and the higher the percentage of butter fat. Experiments have clearly demonstrated this, and, if the ordinary disturbing influences were carefully considered, it would be found that horns upon ill-tempered cows are the main causes of the trouble.

Although the depriving of even wild cattle of their horns is neither difficult nor even so painful as is ordinarily supposed, yet, for dairy herd purposes, there is another and a practically painless method—it is that of killing the budding horn in its earliest stage of growth by means of caustic potash. The method adopted is to tie the calf's legs and lay him down, then cut with scissors the hair from around the bare place where the horn would be. Moisten the skin and rub with a stick of caustic (first covering it with something to protect the fingers; keep rubbing till the skin is removed, and a little white spot (the embryo horn) appears. This is the secret of the whole business. Rub this a little, and the job is done; nothing more required. The only pain the calf has is a little irritation of the skin.

Should a dwarfed growth appear, this is attributable to not getting at the white spot. The outer cuticle has to be rubbed through until this appears, and when it is touched with the caustic the work is complete.

That the system is effective has been fully proved. It has been carried on for many years, and the cows which were thus treated as calves when closely examined in the bails are as free of horns or any appearance of horns as cattle born naturally polled. Taking into account the simplicity of the process, together with the profitable character of its results, no dairy farmer should omit its practice.

DAIRYING.

The dairying industry in Queensland promises to become at least the third great business of the State. The returns from it have already reached an export value (in 1906) of £582,326, which means that the gross returns have totalled nearly £700,000 in butter alone, and nearly £60,000 in cheese. During the year 1906 there were over 1,100 more producers engaged in the industry than in the previous year. There are over 10,000 establishments handling either cream only or cream and butter.

Nearly 52,000,000 gallons of milk were dealt with, producing 44,500,000 gallons of cream, whilst the butter produced totalled 22,746,593 lb.

And yet this great industry could be still bettered were it not that there are some farmers engaged in it in a lukewarm kind of way, who fail to make it pay because they are without devotion to, and enthusiasm for, their business. If all were inoculated with that feeling it would be as well to give up dairying and try some other business. But let us consider the actualities and possibilities of dairying and the advantages it offers. To begin with, it is the one and only branch of farming which, if properly pursued, would leave the farm very much richer and far more fertile than it found it. "Proper dairy farming," said Mr. J. Davidson, manager of the Murrumbum Cheese Factory, S.A., "takes practically nothing from the farm, and if the money realised from the sale of the by-products were invested in the purchase of artificial manures to help to grow fodder crops the land would be steadily growing richer and more fertile." Here in Queensland, as a rule, this outlay for manures is not needed—has not been needed for a long series of years. The farming lands in all directions are so wonderfully deep and rich that manuring would be a useless expenditure. Mr. Davidson went on to show that systematic dairying afforded steady and profitable work the whole year round, and the product was readily saleable. Again, dairying furnished a highly condensed product as compared with wheat, potatoes, &c., and the carriage of it to market did not take the gilt off the price obtained. For instance, butter is worth £100 per ton, and cheese £50, and it would cost no more to carry a ton of these products to market than would be charged for a ton of grain. The dairy, moreover, gave a finished product, and the almost universal rule was that an article that was ready for immediate consumption commanded relatively better prices than those which had to be handled by half a dozen men, with perhaps as many profits, before they reached the consumer. Dairy work, too, brought a steady, constant income from month to month, which enabled the farmer to pay as he went all the year round. Furthermore, the work had to those engaged in it a future, for there was always something to learn. It was one of the branches of farming in which the spirit of investigation and the inventive faculty of the country were most actively engaged, and it was gratifying to note that Australian farmers were giving more time and attention to reading and study, which was a hopeful sign. Another advantage of the dairying industry was that there were no present indications of over-production of the best butter and cheese. There was also a possibility of profitably utilising all the by-products of the dairy in raising pigs and calves. Pig-keeping and bacon-curing should always be a necessary adjunct of dairy farming, and were paying lines. Progression in dairy farming was very evident throughout Australia to-day, which was very gratifying, for dairying, he said emphatically, was a sound business, built upon a solid foundation, and possessing a brilliant future. There were other advantages connected with dairying that he would not refer to in detail, but their general result was that of all communities of farmers in Australia and New Zealand none found themselves in easier circumstances, and with more cash in the bank, than those in which dairying was intelligently and diligently pursued.

As one instance illustrating the great profits of dairying, it was stated that a farmer bought 130 acres of land at £45 per acre in South Australia, and his gross returns for the first year totalled £1,200.

THE TREATMENT OF REDWATER.

We have given several recipes for the treatment of redwater, recommended by the Veterinary Officers of the Department of Agriculture and Stock, which have proved to be more or less efficacious, accordingly as the treatment has been properly or improperly carried out. Here is a remedy given by Mr. D. Hamilton, M.R.C.V.S., in a paper read before the Irish Central Veterinary Association some time ago:—

"Taken," he says, "in the earliest stages, a simple purgative of Epsom salts with oil of turpentine or sulphuric acid is often sufficient to check the disease—I presume by clearing away the altered material before it has gone far enough to affect the animal materially, and while sufficient strength remains to withstand and eliminate the degenerated products from the system. Cases have occurred to my knowledge where, though fully marked, in the course of an hour or so the water has become natural and the animal apparently well without any treatment whatever. It is difficult to account for such cases, and they are anything but frequent. The ordinary course is that the disease progresses until checked by medical treatment.

My favourite treatment, and it has proved very efficacious in my hands, is oil of turpentine and perchloride of iron; small doses of turpentine—I rarely give more than half an ounce—and one drachm of the perchloride of iron every four hours. Large doses I have found injurious, irritating the already irritated kidneys. Where there is weakness or much debility, stimulants can be given with advantage, and other restorative measures may be used as the individual case demands. Further, the animal's strength should be maintained with nourishing drinks of flax-seed tea or oatmeal gruel.

PASPALUM FOR TICK COUNTRY.

Mr. Seccombe, a gentleman who farms a large estate in the Blackall Range, near Mapleton, writes as follows on the subject of the destruction of ticks:—

Before the advent of paspalum is was a recognised fact that feeding cows on green lucerne considerably reduced, if it did not eradicate, ticks. The eggs, he says, require dry grass or rubbish to hatch in, and the presence of this is accountable to a large extent for the increase of ticks. Quoting from his own experience in the Blackall Ranges, he says ticks were brought into the paddocks on all cattle purchased after first laying down the farm with paspalum. Dipping was resorted to several times the first year, but last year, having purchased cattle but once, there was only one dipping. Right through he has had no casualties from redwater. The disease has been rampant this year on the surrounding country, and one station only 12 miles distant lost 25 per cent. of their breeding stock. The paddocks free from undergrowth appear to be free from ticks. He contends that ticks will not breed in paddocks properly laid down with paspalum, and kept free from rubbish, if the grass is fed down systematically and not allowed to run to dry straws.

JOLTING MILK DURING TRANSIT.

Another new discovery has lately been reported. In one particular factory it was repeatedly noticed that the milk supplied by farmers from a distance yielded less butter in proportion than that which had only to be brought a short distance. This led to experiments on the effect produced by the jolting to which milk is liable during transport. The method adopted was as follows:—A quantity of milk was taken and divided into three parts,

from which butter was made after cooling, followed by ten hours' creaming. The three parts (A, B, C,) were, however, subjected to different treatment; A was at once cooled by means of ice-water; B after standing two hours; C after being placed in a tin can and driven about for two hours in an ordinary cart. The average results were as follow:—Taking the yield of A in butter as 100 per cent., B produced 93·2 per cent., and C 88·5 per cent. These figures show that it is by no means a matter of indifference whether the milk is at once cooled or whether it gets a prolonged shaking. The shaking seems to diminish the yield, causing great uncertainty and irregularity in the results. Finally, keep good cows, feed them well, give them plenty of food and shelter, treat them kindly, and observe scrupulous cleanliness, and prosperity is assured.

The Horse.

PRJEVALSKY'S HORSE.

Mr. James Moffat, who has contributed several valuable articles on horse-breeding to this Journal, sends us a paragraph from the "Peebleshire Advertiser," which will doubtless interest many of our readers. Mr. Moffat has always held that the horse should be scientifically studied "as it never has been, in historical times at least." When he first gave his views on the horse in the Journal, he sent copies containing his articles to Professor Cossar Ewart, having at the time no idea that the horse was a special study of the latter, but only hoping to interest him on the subject as a professor of natural history. The paragraph alluded to is as follows:—

Professor Cossar Ewart's investigations into the natural history of the horse are well known, and the latest fruit of them is an introduction which the professor has written to a book published in the Russian language and translated by Captain M. Horace Hayes, who was an occasional visitor at the Penicuik natural history experimental station, and by O. Charnock Bradley, M.B., D.Sc. The book itself is written by W. Salensky, Director of the Zoological Museums of the Imperial Academy of Sciences, St. Petersburg, and the English translation is published by Messrs. Hurst and Blackett, London. It was long thought, says a reviewer, that genuine wild horses had ceased to exist in Europe; but some thirty years ago, as Professor Cossar Ewart tells in the interesting introduction which he contributes to this volume, a Russian traveller discovered a new type of horse in the Greek Gobi Desert. The animal was fully described in a study by a Russian naturalist, whose work is here rendered into simple and readable English, and furnished with an equipment of illustrations that do not a little to help out the careful and exact observations of its text. The book has its first interest as a scientific monograph in the natural history of the horse; but is not without its appeal to circles wider than that of the devotees of pure science. Professor Cossar Ewart maintains that a horse of this type has played an important part in the making of Shires, thoroughbreds, and other important breeds, and shows how the Prjevalsky is likely more and more to attract the attention of men interested to improve the breed of domestic horses.

Poultry.

THE CAMPINE.

We have been hearing very little about the Campine breed of poultry for the last two or three years. Some time ago we believe that they were bred by Mr. Pitt, Secretary of the Queensland Agricultural College, but it looks as if the breed were falling back in public estimation. As a matter of fact, although it was boomed some five years ago, the general impression prevails that the Campine is a decent layer, but nothing very extraordinary. It was a good bit over-estimated at the start. Add to this that the eggs are rather small, and there seems no reason now why everyone who wants eggs should apply to the Campine for them. Still, the Campine is a nice-looking bird, which will doubtless yet improve in externals, and there is no reason why its laying qualities should not be improved. It produces most eggs during spring and summer, and is a non-sitter.

DO THUNDERSTORMS SPOIL EGGS?

The question is sometimes asked, "Do thunderstorms spoil eggs when the latter are undergoing incubation?" In a great many cases they do not; in a few, we believe, a certain percentage of the eggs are affected. The latter, as a rule, are eggs which were not quite fresh when put into the incubator, or had travelled a long distance before being set. Perfectly fresh eggs are but little affected by thunderstorms; we doubt if they are affected at all. A good many people seem to have a notion that a bad hatch is sure to result if there is thunder in the air during the period of incubation, but we think a little observation would modify such views considerably.

DEATHS FROM FATTY DEGENERATION.

A good many deaths among fowls are caused by fatty degeneration of one or other of the internal organs. This is invariably caused by unsuitable feeding, usually combined with over-feeding. A prolonged excess of starchy materials in the food will produce this condition, and birds so affected are of no value for any purpose whatever. As breeders they produce unhealthy stock, and are even unfit for culinary purposes. There is no excuse, as a rule, for birds being brought to such a condition. Proper feeding would prevent it. No large supplies of potato peelings, soaked bread, maize, or such like, but a healthy dietary of sharps, oatmeal, ground oats, barley-meal, biscuit-meal, with wheat, barley, oats, French buckwheat, and a little maize now and again, all used in turn, or a mixture of one or two of them. Animal food in moderation is very useful, especially to birds in confinement, and during cold weather. Changes of food are very necessary, and should never be forgotten. Birds which have been badly fed and show signs of fatty degeneration should be put on a new dietary, in which abundance of fresh vegetables forms a prominent part. Starchy stuffs should be eliminated as far as possible. A little Epsom salts every other day for a week, followed by a sulphate of iron tonic in the drinking water for some time, will do much good.

The Orchard.

PEAT DUST FOR PACKING FRUIT.

Last month we received—unfortunately, too late for publication in the last issue of the Journal—a letter from Messrs. Webster and Co., Limited, informing us that they have a small supply of peat dust on hand, which would be supplied to anyone desirous of making an experiment in the packing and preserving of fruit with this material, at a merely nominal cost.

In the July, 1907, issue of the Journal (p. 24) we published an article detailing some highly successful experiments in the shipping of fresh citrus fruits from Palermo, Sicily, to Togo, a German settlement in Africa, packed in peat dust. The voyage lasted 55 days, and out of 45 *fully ripe* oranges packed at Palermo 41 arrived at their destination in a perfect state of preservation. Even the mandarins kept well. The fruit was sent in reed baskets, packed in fruit paper and peat. Envelopes of silk paper were used to keep the fruit humid. The fruit had to travel from Palermo to Hamburg, Germany. Arrived at Togo, the parcels were kept some time before being forwarded to their destination—a town in the interior, 230 miles from the coast. The oranges, &c., packed in a rough covering of reeds, arrived in the best of condition, but some packed in boxes covered with tin plate showed traces of moisture. Young trees were also sent, and arrived in perfect condition for planting.

These experiments have clearly shown that peat is an invaluable means of preservation in packing fresh fruit. Needless to say that any fruit so shipped should be properly sweated before packing. Cannot our fruit be sent to London in this manner? We should like to hear of some enterprising citrus-grower making an experiment, which, if successful, would open the world's markets to our fruit-growers.

DRYING MANGOES.

Owing to the universal planting of mango-trees on the coast lands of Queensland, from South to North, and to their wonderful prolificity, the fruit is a perfect drug in the market. If any means could be devised by which the mango could be put on the market in large quantities in a preserved state, other than chutney, possibly the heavy crops might be turned into cash. From the "Hawaiian Forester" we learn that this end has been attained. Mr. H. Roberts made an experiment in sun-drying mangoes which was said to be highly successful. The dried fruit was shown at a meeting of the Hawaiian Farmers' Institute, and met with general approval; many well-known fruit-growers present expressed their opinion that the product could be marketed on the coast. [Mainland of the United States (?)—Ed.] We have not heard how the drying affected the weight of such a juicy fruit, but that would be a matter of small moment if a good, soft, fig-like product resulted. Our mango season in Queensland is now approaching, and we should like to hear that some of our mango-growing readers intend to experiment in this direction. It is possible that a new and paying industry, and one which, judging by banana-drying, can be carried out with little labour or expense, might be established.

Apiculture.

BEES *V.* COWS.

Much has of late been written on the profits to be derived from bee-keeping, and the only wonder is that more people—even those in cities, where there is a garden handy—do not keep more bees. From reports of what is being done in New Zealand, it would appear that bees pay better than cows. Here are two items from our New Zealand exchanges which seem to prove the contention:—

Are bees more profitable than cows? In Southland, according to Mr. James Allan, President of the Southland Bee-keepers' Association, they are. Mr. Allan is a practical dairy farmer, with a fine herd of dairy cows, and he goes in for butter-making on practical lines. Yet, despite the excellent prices that have been ruling this season for dairy produce, Mr. Allan affirms that he made more out of his bees than his cows. His dairying returns were £200, and his honey £160; but, after deducting the cost of maintaining the cows, he finds that the bees give the most net profit, and their cost is practically nil.

The "Christchurch Press," in a report of the inaugural meeting of the Canterbury Bee-keepers' Association, stated that one man in the Wairarapa obtained no less than 32 tons of honey from his hives. A contemporary also has this information from an authoritative source, and the informant declared that the 750 colonies of this successful bee-keeper could be kept on 2 acres. As he sold all his honey, and that before it was made, at 4d. a lb. net wholesale, the returns amounted to £1,194 13s. for the season.

THE BEE-KEEPERS' TROPHY AT THE NATIONAL ASSOCIATION'S EXHIBITION, 1907.

Mr. Geo. F. Fletcher, Munyong Apiaries, near Warwick, sends us the following particulars descriptive of the trophy in the apicultural section at the late National Association's Exhibition at Bowen Park:—

The exhibit here illustrated was made in response to a special effort of the Queensland Bee-keepers' Association, to stimulate the industry, and the general result must be gratifying to the executive and to the honorary secretary in particular, on whom the lion's share of the work naturally fell.

A canvass by the secretary resulted in a few prominent Brisbane merchants, headed by J. Reid, Esq., subscribing a substantial sum, which was further increased from the funds of the Bee-keepers' Association. The competition brought forth two competitors only—a somewhat disappointing result from a numerical standpoint, but leaving nothing to be desired as a representative display of the resources of our State in apicultural products.

The winning trophy, of which we present a photographic reproduction, came from the neighbourhood of Warwick, on the elevated region of the Darling Downs, a district long celebrated for the choice quality of the honey produced there. There are climatic reasons for this excellence, in addition to the wealth of native and imported flora. With an altitude of some 1,500 feet above sea-level, and a dry, bracing atmosphere, the ripening process of the nectar commences even on the flight of the laden bees from the fields. This dry atmosphere also assists materially in the storage of the product after extraction from the combs, the Warwick bee-keepers being never troubled with the souring of their product through the absorption of moisture. However, all these natural advantages would avail little were not the industry carried on in most cases as a specialty by specialists. The amount of money

Plate XV.

A Queensland Beekeeper's Trophy at Bowen Park Exhibition.

invested, and the care taken to place a first-class article on the market, has resulted in an enormously increased local demand, and a widespread reputation among our Southern neighbours, one Melbourne firm, in particular, going to the expense of sending their representative annually to purchase the various crops.

The above trophy contains some 300 very prime section honey. Granulated or candied honey is shown in various styles of glass and in various flavours, the predominating being "Lucerne," or, as our American cousins call it, "Alfalfa," characterised by E. R. Root, editor of "Gleamings in Bee Culture," as "the finest honey in the world, without exception."

This lucerne honey is also shown in "bricks" of various size, and in "bars," which, when deprived of their wrappers, appear like bars of soap, but, like a certain brand of that useful commodity, "Won't wash clothes." Liquid honeys are also shown in glass and tins, from various sources, all more or less derived from the eucalypts, but *not one* having any flavour of eucalyptus extract, to which so much exception has been taken.

VARIETIES OF COCOA.

Cocoa buyers state that a low price is frequently given because the beans are not all from the same variety of tree, that the good and inferior kinds are mixed, when, naturally, the inferior rules the price.

On many estates the pods are of all kinds, and it is impossible to say to what variety any particular tree belongs.

There are three chief varieties of cocoa grown in the West Indies—viz., the Calabash, Criollo, and Forastero.

The Calabash pod of typical form is small and round, with a smooth skin; the beans are flat, bitter, and of a dark-purple colour inside.

The Criollo pod is thin-skinned, and has a "bottle-neck" near the stalk; the beans are rounded, sweet, and white inside.

The Forastero has a thick skin, deeply furrowed; the beans are somewhat rounded, slightly bitter, and pinkish within.

The Criollo cured cocoa gets the highest price, but the tree is the most delicate of all, and liable to disease. It can only be grown on the very best soils.

The Calabash cocoa takes twice the time and attention to ferment it as the Criollo, and fetches a very low price. The tree is, however, very hardy, and will thrive on poor soil where other kinds would not grow.

The Forastero is intermediate in character between the other two. The quality of the cured cocoa is good, but not as fine as Criollo. The tree, however, is not subject to disease, and bears large crops. This is the variety recommended for planting in Jamaica, and is the one distributed from Hope Gardens.

It is of great importance to planters to have as nearly as possible only one kind on his estate. For instance, if an estate has some trees of the Calabash variety, and some Forastero, the beans must be separately cured, or the fermentation will be too long for some and too short for others, resulting in a badly cured sample.

In planting out an estate for the first time, the choice should be made of one variety, and nothing else should be grown. Many estates get a low price for the cocoa simply because the trees are not even in character. The colour of pod does not matter.

As regards situation for growing cocoa, it should not be planted on dry ridges, but in moist, sheltered valleys, and this is essential in districts where the rainfall is small and uncertain.—"Planting Opinion."

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, Colonial Botanist.

Order ORCHIDEÆ.

TRIBE NEOTTIEÆ.

ANŒCTOCHILUS, Blume.

A. Yatesæ, *Bail. sp. nov.* (After Mrs. Arthur Yates.) The whole plant more or less pubescent. The flowerless stems creeping, bearing about 6 leaves, the flower-bearing stems creeping at the base and bearing about 3 leaves, erect for about 5 in., bearing in the upper part 3 sessile flowers and below the flowers 3 empty bracts, the lowest one coloured like the leaves and larger than the others, all lanceolate, but those subtending the flowers narrower than the empty ones. Leaves 5-nerved rotund-ovate, with a more or less elongated point, 1½ in. long, 1 in. broad, upper surface dark-green reticulated with silvery white lines; when fading, leaf becomes of a more or less deep-red colour; free part of petiole 2 lines long, the sheathing base 3 lines long, and prominently 3 to 5 ribbed, and coloured like the blade of the leaf. Ovary 6 lines long. Sepals lanceolate, about 4 lines long, rather broad and thick at the base; colour somewhat brownish or pinkish. Petals white or pinkish, nearly as long as the sepals, linear, and very membraneous, faintly showing a midrib. Labellum much longer than the other segments, lobed near the base, and bearing at the apex 2 obliquely triangular small lobes, the intermediate marginal laciniæ long and flexuose, the disk calli minute red. Spur rather prominent, white membraneous, blunt, bearing inside near the base 1 or 2 tufts of white minute calli. Column short, the appendages rather larger. The above is from a plant (the only one obtainable) the flowers of which, although fully matured, faded before opening fully out. Its nearest ally is probably *A. regalis*, Blume, from which it differs sufficiently to bear specific rank at least for the present; thus I have named it after the lady who has furnished the material for the identification of the plant after it had been known only from imperfect fragments since 1891.

Hab.: Near Kuranda, 1891, *C. J. Wild* (a leafy growth); 1897, *Mrs. Remilton* (a small plant, no flowers); *Mrs. Arthur Yates* (plant in flower), all from the same locality.

The very great beauty of the foliage of these plants and the difficulty of their cultivation have induced me to give the following, which is extracted from accounts published by some of the most successful growers in Europe of *Anœctochili*:—

One of the species from its great beauty, and to which ours is a close ally, is known in Ceylon as the King of the Woods, and in England is considered the most beautifully variegated plant known. The flowers of all are unattractive; thus the plants are only grown for the sake of the foliage; it is, indeed, the habit of some growers to nip off the flower-stems on their first appearance, and thus give the whole strength of the plant to the formation of leaves.

The plants make but a small quantity of roots; therefore, only require small pots, in which should be given ample drainage; cover this with a little moss, and fill up with the following compost:—Sphagnum chopped into small pieces, with a little good fibrous peat and silver sand, all well mixed together. In placing the roots in the pots, raise the stem a little above the rim. They should never be allowed to become dry or sodden. If thrips and red spider attack them, these should be washed off with a solution of tobacco and soft soap.

Tropical Industries.

THE CULTIVATION OF RUBBER FOR TROPICAL AUSTRALIA.

No. II.—PARA RUBBER.

By HOWARD NEWPORT, F.R.H.S., Instructor in Tropical Agriculture, Cairns.

CHARACTERISTICS OF THE PARA RUBBER TREE.

The rubber-producing tree, commonly known as Pará, is botanically called *Hevea braziliensis*, of the order Euphorbiaceæ. The tree grows to an ultimate height of 60 or 70 feet, and attains a circumference, some 3 feet from the ground, of 6 to 8 feet, though old trees of 10 to 12 feet in circumference are recorded. The leaves are ternate—*i.e.*, three-lobed, and the individual pinnæ from 8 to 10 inches long by 2 to 3 broad, the petiole or stalk of the leaf being often a foot long; the colour is light green, but the colour as well as the shape and size of the leaves vary very considerably in different trees. It is deciduous—*i.e.*, loses its leaves annually, in this country generally about the end of the year. The flowers are yellowish to yellowish green, and carried on cymes 6 inches to 15 inches long, are insignificant in size, but have a very distinctly pleasant scent. They are monœcious—*i.e.*, the male and female distinct, but in the same cyme. The fruit is generally three-celled, but not invariably so, as fruit with four are occasionally found. Fruit apparently two-celled may also be found occasionally, but examination will invariably disclose the atrophied third cell in such cases. The fruit is borne at the end of a petiole of varying length, seldom less than 3 inches, and when ripe may be 2 inches or so in depth and more in diameter. As it ripens, the green bark turns slightly yellow and partly peels off, disclosing a woody and hard shell. Before the outer covering has entirely peeled off, and sometimes before it has begun to do so, this shell bursts noisily, throwing the seed it contains considerable distances, but generally falling itself under the tree. This bursting usually takes place with a change in temperature, and more often when that change is from cold to warmth. Hence at, or soon after, sunrise the popping of the seed pods can be heard, and it is not an uncommon thing to find the ground beneath the tree strewn with empty shells and never a seed to be seen. If the seed is required, therefore, it is necessary that a space of at least 50 or 60 feet should be kept clean round the seeding tree, or that the pods should be picked before they burst, when by placing in the sun under a sieve the seed can be saved. I have known, however of the seed under such conditions being expelled by the bursting capsule with such force as to crack the pericarp. The seed is about 1 inch long by ½-inch to ¾-inch in diameter, more or less flattened on the side nearest the stalk, and is a light brown, prettily marked with blotches of darker brown. The bark of the Pará rubber-tree is grey, and generally smooth, but sometimes slightly corrugated in old trees. It is shed in small corky fragments, and does not peel off. In thickness it varies from about ¼ to ¾ of an inch, and in texture is granular rather than fibrous or stringy. The tree forms a tall straight branchless trunk for sometimes 20 or 30 feet, seldom branching in less than 10 feet. The branches are generally in whorls, and are rather brittle. The canopy is light and feathery rather than dense.

The economic properties of the tree lie in the milky secretion or latex which is found only in the bark and leaves, and the coagulation of which produces the Pará rubber of commerce. There are some ten or twelve species of Hevea, all of them rubber-producing, though not so largely or satisfactorily as the *Braziliensis*. The distinguishing characteristics of the *Braziliensis*, so

far acknowledged the best of the rubber-producing trees both in quality and quantity, are given by Mr. Herbert Wright* as (1) having its anthers in a single whorl; (2) accuminate male flower bud; and (3) sessile stigmas.

CLIMATIC CONDITIONS REQUISITE FOR THE CULTIVATION OF PARÁ.

In its natural or wild state, the Para rubber-tree is found in the vast forests of the tropical portion of South America, in the valley of the Amazon and its tributaries and the highlands around. The district of Pará, from which the tree takes its name, is a very large one. The town of Pará, on the river, or rather estuary, of that name, is situated on the east coast of Northern South America, between latitudes 1 degree and 2 degrees south, but the district itself extends from several degrees north of the Equator to 10 degrees or so south, and the area in which this tree may be found, and where it thrives luxuriantly in reality, extends considerably further north and south of the Equator. It is known and admitted now that the very finest specimens of wild or native trees are found on the highlands at the back of the Amazon Valley, and it has been shown that the Pará tree will not only thrive under oonditions of very varying temperature and rainfall, but will adapt itself readily to very different soils to those that are to be found in the rich alluvial valleys of South America at latitude 1 degree south.

The latitudes within which the cultivation of Pará may be successfully undertaken may be taken as about 20 degrees north to 20 degrees south of the Equator; rainfall, 30 to 150 inches; temperature extremes of about 40 degrees Fahr. to any moist heat, but averaging not less than about 75 degrees. The climate generally should be humid—*i.e.*, steaming and forcing rather than dry; the lay of the land such as to afford reasonable drainage, although occasional flooding is not detrimental to established trees; the aspect protected from strong winds; and the elevation up to about 2,000 feet from sea-level. The tree prefers a well-defined wet season or monsoon, though a well-distributed rainfall is preferable to a very dry summer season.

In Ceylon, Singapore, and the Federated Malay States the best results would seem to be obtained under conditions of average temperature of 75 degrees to 85 degrees Fahr., rainfall 50 to 100 inches, elevation 50 feet or so above sea-level, and a low-lying situation, protected aspect, nearly flat land with rich alluvial soil even inclined to sandiness, fairly well drained, with a strong subsoil.

THE AREA AND LOCALITIES IN QUEENSLAND ESPECIALLY SUITABLE.

In obtaining these conditions the area more especially suitable for Pará rubber in Queensland would be enclosed within an imaginary line drawn to include the Burdekin lands down by the junction of that river with the Suttor to the southward of Northern Queensland, following the course of this river northward into the valley of the Herbert, thence mounting the ranges (but to an elevation not exceeding 1,500 to 2,000 feet or where frost is met with), round to Oaklands on the Cairns-Atherton Railway, and along the ranges still northward to Princess Charlotte Bay. This must not be taken as a hard and fast line, however, for the area thus roughly indicated has perforce to include some small areas that have either insufficient rainfall, are too cold, or on which the soil is too poor and metalliferous for any agricultural operations. Generally speaking, the most suitable localities are in the valleys of our northern rivers, from the mouth of the Burdekin in the south to the Normanby in the north, a distance of some 4,000 miles, including eighteen more or less important rivers, and, roughly, some 20,000 square miles of country.

Northward of this, and for that matter along the western coast of the North Queensland Peninsula and into the Gulf of Carpentaria, localities with suitable rainfall, soil, temperature, and situation may here and there be found;

* Herbert Wright, A.R.C.S., F.L.S., "Pará Rubber," Ceylon, 1906.
† Notes on Rubber-yielding Plants, by Dr. Trimen.

Plate XVI.

Rubber Seedlings at the Germinating House, Kamerunga State Nursery.

and southward of this southernmost point mentioned, isolated localities may also be found where, the climate being mild and the situation protected, Para rubber will grow. Some such spots might be found about Mackay and Mount Buderim, &c., where frost is not met with, but as the climate becomes colder, even though the tree may live, it becomes slower in growth, stunted, and with a thin hard bark.

Soils, Aspect, Lay, Etc.

While it has been found that Pará rubber will adapt itself to very varying soils, it is most partial to a rich alluvial scrub soil, fairly well drained. Very satisfactory results have been obtained from trees planted in drained swamp land, and it is recorded that no deteriorating effects have been observed in the case of trees once established, by the land being occasionally flooded, but undrained swamps should be avoided. A well-drained, retentive soil is preferable, and our rich volcanic soils should be eminently suitable for the tree. The presence of rocks and boulders offers no objection, except in the matter of enhanced difficulty in culture and keeping clean, but, generally speaking, stony ridges should be avoided. Nor is a porous subsoil essential; the presence of clay beneath the surface is not detrimental, provided sufficient drainage exists to prevent coldness or sourness of the soil.

The aspect of a plantation well within the tropics is immaterial. If strong winds are prevalent, an aspect avoiding these should, of course, be selected. If frost is feared, and often this may only become apparent after the clearing of new land, an aspect in which the early morning sun is avoided until 9 or 10 in the morning, as on the western side of a hill, should be chosen.

In the matter of lay, gently sloping or undulating land is perhaps better than absolutely flat land, but even dead flats are better than positive hillsides both for the growth of the tree and facility of working. If at a low elevation, even hillsides can be successfully utilised. The matter of the elevation at which Para can be best grown is still open to debate, but in this latitude it is advisable to remain as near sea-level as possible. On the ranges and tablelands, while the soil may be richer, the climate changes so quickly and the extremes are so great that care must be exercised in the selection of localities for rubber culture.

Propagation.

Pará rubber may be propagated from seed and cuttings. The latter method is uncertain and unsatisfactory, however, and if possible, seed or already germinated plants should be obtained. The seed is of very short vitality; a fortnight is about the longest period it can be kept with any degree of safety, and then it must be guarded from either undue heat and moisture on the one hand or cold and dryness on the other. Experiments here have shown that in a month but a very small percentage of seed is fertile, and that the best results are obtained by setting the seed as soon as obtained. In sowing the seed, boxes, pots, or well-protected beds are best with a soil made up of 2 parts sifted leaf mould and 1 part fine sand. In this the seed should be only just buried, and but lightly pressed. Care must be taken to prevent depredations of vermin, such as field rats, &c., which soon become fond of the oily seed, and root up more than they consume. The seed beds or boxes should be kept moist and warm, not too wet on the one hand, or at any time allowed to become dry on the surface on the other, either fault causing a heavy loss of plants. The seed may be set 6, 8, or 12 inches apart according to available space and convenience. If for transport in shallow cases, they may be set actually touching, but in that case must be transplanted to a nursery bed as soon as they germinate. In about a week the seed will germinate and send up a thin delicate shoot which often attains a foot in height before the first leaves open. At this period the plants require careful guarding, either from strong sunshine, wind, or insects, especially grubs, slugs, &c. Experience has also shown that cane grubs are very partial to Pará rubber plants when in this

stage, if they can obtain access to a nursery. Excessive watering should be avoided. In six to eight weeks the plants, though still tender, may be planted out in the field. Better, however, if they can be left until three months old. If it is found necessary to retain them in the nursery even for a full year, the plants may be stumped or cut back to 18 inches or 2 feet from the ground, and may still be planted out with success. The seeding season in this country is in February or March, and the best time for planting out in the field during the early rains in November or December, or even till March. With an early cropping season, and a well-continued or late rainy season, and well-grown plants, they may be planted out into the field the same year; but it is usually safer and better to keep them in the nursery till the next favourable planting time, which in seasons here may be met with as early as September.

The cost of seed is about 1 cent each in Ceylon and Singapore, and in this country a charge of 1d. each or 1s. per dozen is made where seed is available. Plants are worth from 6d. to 1s. each at present. If imported, which, as already stated, can only be done through the Department of Agriculture, they may be obtained in bulk for less. Good stump plants should be worth at least 1s. each in this country at present.

PLANTING, GROWTH OF THE PLANTS, AND CULTIVATION.

The best distance apart is about 15 by 15 feet, giving 193 trees to the acre, to allow for roads, irregularities, failures, &c.; 14 by 14 feet is, perhaps, more often the distance taken (222 to the acre); to ensure about 200 trees to the acre, 15 by 14 is a good medium for a field of rubber, but if planted on an already opened estate in lines along roads, fences, or gullies, &c., in single lines they may be put at any distance from 12 to 20 feet apart. Holes are necessary for the young plants, whether the land be already ploughed or not, but these need not be large, about 18 inches cube being quite big enough. The young plant should be shaded in any case, when first put out, by the branch of a green tree or leaf of a palm stuck in beside it on the sunny side or even on both sides. Should the weather prove unexpectedly dry after planting, it will pay to give them a little water, as, if the plant droops much at the time of transplanting, it is checked to an extent that takes it a long time to recover.

The root system of the Pará tree discloses a strong growth of surface roots with a fairly long tap root. The tree derives its nourishment mainly from the first 18 inches or so of the soil, but in a porous and dry soil the roots will go deeper and the tap root goes down a great distance for moisture. The rate of growth, after the first 3 or 4 feet of height are attained, is slow. The goal of the planter is to attain the requisite girth of 15 to 18 inches, or diameter of 5 to 6 inches (at which size only can tapping be safely commenced), as soon as possible. This will take about five years, and possibly even six, by which time the sapling will be 25 to 30 feet high. To attain this size as early as possible, the advantages of cleanliness, cultivation, and attention are obvious.

So far as cultivation is concerned, but little is required. The rubber plantation or field must be fenced in, for stock and cattle greedily eat the young leaves of the saplings if within reach, and even the plants themselves if small enough. The drainage of the land should be looked to as above shown, but roads are not especially necessary, as no bulky raw material has to be carted, and there is ample room in the field to take even a dray if required, if properly planted at the distances mentioned. The presence of undergrowth immediately round the plant, and especially grass, will retard its development, and the plants must be kept clean, weeded for 3 or 4 feet round at least; therefore by far the best method is to keep the whole field clean by scarifying for the first three years or so until a canopy of leaf is formed which will prevent any great growth of weeds, &c. If the young plants show any signs of check after the first year, a light forking round them for 3 or 4 feet

materially encourages them. No manuring is generally necessary during the first year of the tree's life, and, if manure is given with a view of forcing the growth and attaining the requisite size for the production of returns, care must be taken that long whippy saplings of no stability and liable to break in gusty wind are not obtained. The Para tree has a natural tendency to such whippy growth, which must be looked for, and, if necessary, checked when 10 feet or so high by nipping off the topmost shoot.

After about the third year, when the trees are 3 inches or so in diameter and 12 to 15 feet high, but little attention and cultivation become necessary. The trees may then be left to themselves but it is always advisable to retain the fence and keep stock, cattle, and goats, &c., out for fear of damage to the bark—the future tapping area—by biting, horning, or rubbing. As soon as the trees are some 4 inches in diameter 3 feet from the ground, it is advisable to number them off in rows by stencilling the number on the stem—say, as high as can be conveniently reached. This numbering is always useful for record, checking the returns of special trees, identification of trees, &c. Occasionally a tendency to fork near the ground may be noticed; if so, it should be remedied while young by one of the stems being cut away carefully, for one stem not only comes into bearing quicker, but is subsequently more easily tapped than two or more thin stems.

Production and Returns.

The period at which tapping operations may be commenced is a matter rather of size than age of the tree. As above stated, the recognised minimum size is a diameter of 5 to 6 inches, or girth of 15 to 18 inches 3 feet from the ground. Previous to this, not only is the vitality of the tree possibly injuriously affected, but the product is weak, contains more resin, and is generally of poor quality, and, moreover, is so small in quantity that the cost of collecting is very high in proportion to the amount obtained per tapping.

The bark surface from the ground to 6 feet up the trunk is called the tapping area. Tapping higher up has been found to be generally not worth while. The first season in which returns may be expected should, therefore, present a tapping area of 7½ to 10 square feet. Forking or branching above the first 6 feet also has been found to increase this tapping area, and such branching may be ensured by judicious nipping back of the top shoot, as described earlier. This, however, must not be confused with earlier remarks *re* forking of seedlings, which refers to such forking near the ground and within the 6 or 8 feet limit, and which reduces instead of increases the tapping area.

By the time the trees are this size the lacticiferous system, which consists of ducts or cells, and are found throughout the bark of the whole tree, is approaching maturity. These cells consist of a series of sacs or irregularly-shaped tubes, generally long and hairlike, running with the grain—*i.e.*, longitudinally or vertically. These would seem, however, to have no regular continuity, and the area drained by one tapping is but slight. Hence the flow of latex is not long continued, and many tappings are necessary to obtain any appreciable quantity of rubber. These numerous tappings, however, subsequent to the first cut, need only consist of a thin shaving taken off below the last cut, which again opens the ducts, which have, meanwhile, by what is known as "wound response," refilled with milk, or opens new ones. Since the latex tubes run vertically, to open as many as possible and allow for a good flow, the cut must be more or less horizontal. If made quite horizontal, however, while the ducts may be opened, the latex would but flow over the bark and become difficult to collect. To ensure the latex running and making its collection in one spot possible, the cut is made at an angle across the stem, generally at about 45 degrees. The amount of rubber produced by a tree varies very much. On an average, with 200 trees to the acre, the returns are given as ½ lb. per tree in the sixth year, increasing to 3 lb. per tree in the tenth year. To reduce

this to the usual method of calculation in this country, and one more readily understood by the settler—taking the value of rubber at 5s. per lb. only—this means £25 per acre in the sixth year, increasing to £150 per acre in the tenth year.

There is no reason to suppose this is excessively sanguine either, as individual trees of ten years and more have been recorded as giving 11 lb. of dry rubber in the year, or £2 15s. worth each.

No trees of Pará rubber exist at present in this country of sufficiently mature age to ascertain really how much can be obtained here. The trees at the Kamerunga State Nursery are just eight years old. Only ten have, so far, been tapped, and of these ten tappings seven are experiments of different methods of cutting. The results, therefore, can scarcely be taken as a criterion of the possible or maximum quantities obtainable, for had all been tapped by the best method the returns would have been larger; and, moreover, these experiments have not as yet been carried sufficiently far. The yields are:—

Average Tappings.	Trees.	Dry Rubber. Lb.	Dry Rubber. oz.	Average Yield per Tapping. Oz.
42	10	7	$8\frac{3}{4}$	2·875

The tappings were as nearly as possible every day. For seven weeks' work, therefore, the returns obtained (at 5s.) equal £1 17s. 6d. for ten trees of eight years of age, which gives £37 10s. per acre. Or, if tapped for twelve weeks—one-fourth of the year—which is usual and advisable, it represents a return of £64 odd per acre gross. From the way the latex was flowing, I have no doubt had the experiment been continued for the twelve weeks the results would have been more than that stated.

I give some illustrations of the small plantation at Kamerunga State Nursery, showing the tapped trees, the style, and comparative growths, &c.

Methods of tapping and further information regarding yield will be dealt with in a separate article.

RUBBER-PLANTING IN NEW GUINEA.

The prospects for rubber-planting in British New Guinea appear to be so favourable that a very considerable area of land has been taken up for that purpose, and we understand that applications have been lodged with the authorities for several more thousands of acres. The terms on which land can be obtained in the dependency are singularly liberal. No estate in fee-simple can be acquired, but a lease is issued having a term of any period not exceeding 99 years. A lease may be assigned or otherwise dealt with if the improvement conditions have been performed and the rent has been paid, or, in any case, if the Lieutenant-Governor has given his consent thereto in writing. Except as above stated, no transfer, sublease, or mortgage, or other alienation of any land which has been leased shall be valid. The lands are classified as A, land suitable for agriculture; B, lands not so suitable. The unimproved value of a piece of land shall be taken to be the sum which the land might reasonably be expected to realise if all the improvements on the land were removed, and it were sold without them. No survey fees are payable, but with every application for a lease a deposit is payable according to the following scale:—

One pound (£1) where the area applied for is 100 acres or less.

Two (£5) for 100 acres up to 500 acres.

Five (£5) where the area applied for is more than 500 and not more than 1,000 acres.

Ten (£10) where the area applied for is more than 1,000 acres.

No rent is payable for the first period of ten years of the lease, and not more than 6d. per acre during the second period of ten years. The unimproved

Plate XVII.

PARÁ RUBBER PLANTATION, KAMERUNGA STATE NURSERY, AT FOUR YEARS OF AGE.

value of the land is appraised every twenty years during the currency of the lease, and the rent determined accordingly, but if the rent is raised by more than one-third the lessee may disclaim the lease, and will receive compensation for his improvements.

Leases are subject to improvement conditions. In the case of land of Class A and land of Class B, improvements may be either pastoral or agricultural, at the option of the lessee.

The agricultural improvements are—

(*a*) One-fifth of the land suitable for cultivation shall be planted in a good, husband-like manner within the first five years;
(*b*) Two-fifths in ten years;
(*c*) Three-fourths in twenty years;
(*d*) For the remainder of the term three-fourths of the land suitable shall be kept so planted.

The pastoral improvements are—

(*a*) The land shall be stocked within ten years, and be kept stocked for the remainder of the term. Land on which there are 20 head of cattle or 100 head of sheep or goats to the square mile shall be considered stocked.
(*b*) Ten head of cattle or 50 head of sheep or goats to the square mile shall be on the land within five years.

As to the cost of planting 500 acres of rubber-trees on the land obtained on such favourable terms, we take the following estimate from the Royal Commission's Report of 1907:—

	£	s.	d.
Felling, clearing, and holding at £1 per acre	500	0	0
Lining	60	0	0
Nursery expenses	20	0	0
Seed, 16′ by 16′, 20% failure $\frac{5}{10}$ thousand	20	0	0
Planting	40	0	0
Roads and drains	80	0	0
Superintendent's house	50	0	0
Huts for boys	200	0	0
Tools	100	0	0
Contingencies	300	0	0
	£1,370	0	0

Annual Cost.

	£	s.	d.	£	s.	d.
Interest on £1,370, at 6 per cent. ...	82	4	0			
Survey fee	nil					
Rent, 10 years	nil					
Recruiting 200 boys, at £4 each, every 3 years	266	13	4			
Labour, boys at £3 per year	600	0	0			
Supervision	300	0	0			
	£1,248	17	4			
Total cost for 5 years				£7,614	6	8

This estimate is given on a plantation of 340 trees per acre, the trees being planted 16 feet apart every way.

Return on the Fifth Year.

	£	s.	d.
170,000 trees, at ½-lb. rubber each	21,850	0	0
Less 5 years' expenses	7,614	6	8
	£14,235	13	4

The cost of the manager's house appears to be too low. Senator Smith, in his report, sets it down at £250, which seems not too much.

The special correspondent of the "North Queensland Herald" estimated the initial cost of planting 500 acres of rubber in North Queensland at £2,200, but omits the salary for the manager and cost of a house. The upkeep for four years he estimates at £4,500, or a total cost of £6,700, before any return could be expected.

The return for the following years is estimated as follows:—

	£ s. d.	£ s. d.
5th year, 25,000 lb. of rubber at 5s. per lb.	6,250 0 0	
Less cost of collecting and curing, at 6d. per lb. ...	625 0 0	
		£5,625 0 0
6th year, 50,000 lb, at 5s. ...	12,500 0 0	
Less costs as above	1,350 0 0	
		11,150 0 0
7th year, 100,000 lb. at 5s. ...	25,000 0 0	
Less costs	2,700 0 0	
		22,300 0 0
8th year, 200,000 lb., at 5s. ...	50,000 0 0	
Less costs	5,400 0 0	
		44,600 0 0
Total net return for the 8 years		£83,675 0 0

After the 8th year, a steady return of £90,000, the value of 400,000 lb. of rubber, may be expected.

In the Federated Malay States some companies are paying 93 per cent. in dividends.

The world's rubber output is valued at £27,381,000.

	£ s. d.
Output of wild rubber	25,875,000 0 0
Output of cultivated rubber...	1,505,955 0 0
	£27,381,000 0 0

No substitute for rubber has yet been found. Experts say that the cultivation of rubber will be quadrupled when the price is lowered. If the price were to fall below 4s. per lb., it would be used in many new ways, and, consequently, there will be an ever-increasing demand.

A rubber plantation does not require skilled manual labour.

The rubber improves with the age of the tree in yield and quality.

British New Guinea, in 1902, exported 12,983 lb. of rubber, valued at £1,435, but during 1905 the collection of rubber was prohibited for the greater part of the year, and the total export was only 590 lb., valued at £67. The rubber is obtained from indigenous species; but in 1905 and 1906 Ceylon sent a large number of other species to the authorities in New Guinea.

In 1907 a planter took over a ton of rubber collected from the wild trees in New Guinea to Sydney, where it readily sold at 4s. 3d. per lb.

HAND *V.* MACHINE-STRIPPED RAMIE.

The "Indian Trade Journal" publishes the following letter from Mr. A. M. Hart, who is amongst the advocates for the cultivation of the ramie plant. From it we can but arrive at the conclusion that, whilst it may pay to grow and clean ramie in countries like India or China, with their teeming populations, where the cost of labour is a mere trifle, it would never pay to grow it

in this State of Queensland, and clean it either by hand or machine. Cotton, sugar, rice, sisal hemp, and coffee can be produced here to a profit, even under present labour conditions, but ramie can only be successfully produced under the very cheapest labour conditions. Possibly it might pay in New Guinea, where wages amount to about 4d. per day, but certainly in no other part of the Commonwealth could it hold out the slightest prospect of a profit. Mr. Hart's letter, which was addressed to the "Statesman," is as follows:—

VALUE OF FIBRE IN LONDON.

In your article commenting on my letter in the "Manchester Guardian" on the above subject you make the remark that, provided my statements are correct, "the outlook is a pleasant one for India." Will you, therefore, give me a little of your valuable space to enable me to prove my point—namely, that clean-stripped ramie can be produced in India, landed in London, and sold at £15 a ton, at a profit to all concerned. I will quote first the figures which have been put forward, and are vouched for by Mr. John C. Johnstone, for planting an area of 3,000 acres in India, stripping the fibre by hand, and landing and selling the same in London at £15 a ton. The estimate made is on the outturn for five years:—

PLANTATION STARTED WITH ROOTS.

Years.	Area Planted up each Year.	Outlay each Year.	Outturn Rates per Acre per Annum.	Outturn Total probable Tons per Annum.	Value at £15 per Ton.
	Acres.	£	Tons.	Tons.	£
First	200	3,159	$\frac{2}{3}$	130	1,950
Second	200	4,819	1	330	4,950
Third	400	7,207	1	666	9,990
Fourth	1,000	13,867	1	1,406	21,990
Fifth	1,200	24,620	1	2,600	39,000
Sixth	Conservation of 3,000 acres	26,448	1	3,000	45,000
Total		80,120			
Net Profits		42,760			
Grand Total		122,880	...	...	122,880

It will be observed that, estimating an output of only a ton per acre, the selling price of £15 a ton in England gives a net profit of over 50 per cent. on the first six years' working. From this time forward profits would be higher, and experience justifies the belief that when the plants are well established the yield of fibre is from 1 to 2 tons per acre.

In my paper on "Ramie and its Possibilities," read before the Society of Arts last year, and published in a journal of the society of 7th April, 1906, I quoted the experiments of Herr Boeken in Cuba, by which he obtained an output of 2 tons to the acre, estimating that 5 per cent. of dried fibre could be obtained from the canes. This is certainly a high estimate, but it is probable that the yield of fibre will vary greatly according to the climate and soil and the kind of roots used for propagation.

In Mr. Johnstone's estimate it will be noticed that the fibre is hand-stripped. There is a good deal of misapprehension on the subject of freeing the fibre of its outer brown cuticle, and the general opinion is that this must be done by machinery, and that until satisfactory and inexpensive decorticating machines are put on the market it is useless to push the cultivation of ramie. This is a mistake. The fibre is better stripped and decorticated by hand than it can be ever done by machine; and, moreover, in a country such as India, where unskilled labour is abundant and cheap, and can be had for less than 6d. a day, hand-stripping is cheaper than when done by machine. Hand-stripped fibre or China grass will always fetch a better price than machine-stripped, for the simple reason that the parallelism of the fibre is preserved,

and, consequently, less tow is produced in spinning. India need not wait for decorticating machines to develop the cultivation of ramie. Moreover, for a good many processes for which ramie fibre is coming into use it is not necessary to decorticate the fibre at all, and brown ramie ribbons can be used. These can be produced at a much lower cost; indeed, even brown ribbons, stripped from wild ramie, have their uses, and can now find a market.

About 4,000 acres are under ramie in India. This area could easily be increased a hundredfold. Behar could grow 50,000 acres, Assam the same. I have had beautiful samples of ramie sent me from Kashmir. An English company is now being formed to grow ramie in Ceylon; the Madras Government has offered a concession of irrigated land for ramie cultivation; the Gaekwar of Baroda is said to be interesting himself in the matter, and I have myself given the scheme for a mill for treating and spinning ramie on a large scale in India. There is thus evidence that India is awakening from its surprising lethargy on this subject, and that we shall not continue to see the spectacle of European ramie mills closed for the want of raw material, while in India lands lie idle that might yield profitable ramie crops. If India will not grow ramie to meet a constantly increasing demand, we must turn for supplies to the Malay Peninsula, to the Dutch East Indies, to East Africa, and to the Argentine, in all of which countries the planters are on the alert to meet the new demand for ramie.

Allow me to say one word in reply to a question put by Mr. Hosie, and quoted in the "Indian Trade Journal" of 10th January of this year. It is stated that the price of cleaned ribbons in China depends upon their length, because the grass cloth into which they are made is woven of hand-shredded yarn, and the fewer the joints the better the cloth. Now, the ribbons of the first and third crops are shorter than those of the second crop, and it is asked if the shorter ribbons could be used in spinning yarns in European factories, and, if so, why should a fancy price be paid for the long ribbons? To this practical question I would say that the shorter and cheaper ribbons can most certainly be used in spinning low-count yarns, where a phenomenal breaking-strain is not required. The ramie fibre is indeed so long that it has to be broken up in what is called the "filling engine" before it can be spun, and in the most modern combing machines the fibres are sorted out into long and short. There is, in fact, a large manufacturing use for short ramie fibres.

In all the important practical questions as to the types of plant which will produce the class of fibre wanted for different manufactures, the greatest amount of fibre, or the fibre of longer or shorter staple, Government should give assistance by carrying out experiments in the Botanical Gardens and nurseries; but, without waiting for this, planters may proceed with assurance, knowing that the demand for ramie is rapidly increasing in Europe, and that, consequently, a market will be found for their crops.

The importance of the subject must be my apology for the length of this letter.

CASTILLA RUBBER.

CULTIVATION.*

The following information is abstracted from an article by Theodor F. Koschny, San Carlos, Costa Rica, which appeared in the "Tropenpflanzer" for December, 1905. The references to the best variety for cultivation are of particular interest:—

A short time ago only one species of the genus *Castilloa*—viz., *Castilloa elastica*—was presumed to yield marketable rubber. In July, 1901, the writer distinguished a variety of this species under the suffix *alba*. The rubber from *Castilloa elastica*, var. *alba*, fetches from 10d. to 1s. more per lb.

* From "Agricultural News," VI., 125.

in Hamburg than that of *Castilloa elastica*, var. *mexicana*. O. F. Cook has discovered several species of Castilloa on the Pacific side of Central America, all of which yield marketable rubber. H. Pittier has found another species, *Castilloa nicogana*, near the Gulf of Nicoga. *Castilloa costaricana*, which grows at high elevations south of 10° N., differs only in the leaves from *C. alba*; but it yields a very little rubber of a low quality. Unfortunately, it appears that all the plants sent first to South-east Asia and New Guinea were of this nearly valueless species. It is the one planted first in Java.

C. elastica, var. *mexicana*, was the species collected by Dr. Preuss for the German colonies. It produces a good quantity of rubber, and its cultivation is remunerative, but the quality of the rubber is inferior to that of *C. alba*. The latter can replace the best Hevea rubber; the tree is more cheaply tapped than Hevea; the preparation of the latex is simpler, and the returns are greater. Dr. C. O. Weber says in regard to his trials of this species: "The rubber thus obtained is a product of a degree of purity, in which no rubber, not even the finest brands of Para, has ever been offered to the manufacturer." The scrap rubber, when clean, is valued at the same price as the best Sernamby of Para.

Castilloa requires a certain amount of shade. It will not grow at all, of course, under the full shade of a forest. With too much shade it forms thin, tall, easily-broken stems, which increase but slowly in thickness. But it is not a tree for the open. It grows very well in the open as long as the sap is watery; but when it is older and taller the sun strikes on the unshaded trunk and warms the thick latex in the bark. This causes the death of many trees even without tapping. Experience has shown, again and again, that no unshaded plantation of Castilloas will stand heavy tapping for many years.

Up to the sixth year the plantation needs no shade. Two years later, if the plantation is not kept cleared, wild trees and bush will have grown high enough to shade the stems in a moist climate. If this plan is not adopted, or if it is prevented in places by long dry seasons, then shade trees should be previously planted. I have practised leaving forest trees standing singly when clearing the ground for a plantation. If two-fifths or three-fifths of the original forest trees are cleared away at first, the Castilloas grow well. After six years, no more cutting away of bush need be done.

From 1879-82 I planted *Castilloa alba* in open land, and also between cacao, 8½ acres of each. Those in the open died without tapping or at the third tapping. Those in the forest or at the edge of the forest are alive to-day, and have been tapped every year. Castilloa requires perfectly permeable subsoil. Where the soil or subsoil is not of this character, no Castilloa should be planted. Castilloa would not be attacked by the beetle borer if the tree was in health, and, if such is the case, it is to be presumed that the subsoil is impermeable and the tree unhealthy. Seedlings can be transplanted when very small with earth about their roots, or they can be transplanted at a year old if the tap root is cut back to the woody part, all side roots cut off, and also the stem cut back to wood. Such a bare stick must be planted with the crown (from which the first new roots grow) ½-inch to ⅗-inch under the soil. If the crown is above the soil, there is no growth.

The often-advised close planting of Castilloas and subsequent thinning are not usually to be recommended. Where land is cheap or where the wind may be strong, it should be done. Close planting produces trees with long, weak trunks. After thinning, they are easily blown down. It is to be noticed that, in tapping, the strong bast fibres, which help greatly to support the stem, are cut, and a tall tree is then easily broken down by wind.

Tapping.*

Mr. J. Herbert Foster, of Tula de los Tuxtlas, gives in the "Mexican Investor" for 5th January, 1907, his results in tapping Castilloa trees.

* From "Agricultural News," VI., 125.

Mr. Foster shipped about 1,200 lb. of rubber from the Tula Plantation in 1906. The trees averaged 20 to 25 inches around, just about the root enlargement, the largest ones ranging from 30 to 38 inches. He uses a Smith tapping-knife, and makes three V cuts about 20 inches apart, each reaching not quite round the tree, but leaving 5 inches uncut. A small cup is fixed at the apex of each, and the latex spooned down into it. The cups are emptied into a pail. There is no need of water to prevent coagulation. The cups are not left on the trees. After tapping twelve trees, and, again, after two or three hours, the workman returns and spoons out the cuts. At Tula the men tap all day, while at Soconusco the heat checks the flow in the afternoon.

Each man has two 30-gallon barrels. The latex is washed through a fine sieve, together with the washings of the cups, and the result of one day's work usually fills one barrel. The next morning the water is drawn off, as the creamy latex is on the top. The barrel is then half-filled with fresh water, which is changed the same day. On the next morning all the water is drawn off, and the cream poured out into frames to dry in the sun. The frames are made of 1-inch by 2-inch strips, 5 feet long and 10 inches broad, and divided by cross pieces into 8-inch squares. The bottom is made of cotton cloth. In ordinary weather, three to six days are required for drying. In 1905, the average price for Tula rubber and scrap was 1 dollar gold per lb.—Bulletin of the Department of Agriculture, Jamaica.

THE CULTURE OF DIVI-DIVI.

Divi-divi pods contain a valuable tannin substance, which has a good market value, the price of the pods on the London market being from £10 to £12 per ton. Mr. W. Versluys recently read a paper on the cultivation of the tree before the Curaçao Agricultural Society, West India, of which the following abstract was published in the "Agricultural News" of Barbados:—

The cultivation of divi-divi *(Cæsalpinia coriaria)* is of the greatest importance to Curaçao and to the two neighbouring islands.

The seeds should be taken only from trees which yield heavy crops of pods. The pods are ripe when the seeds can be heard to rattle in them. Fully ripe pods, which do not show any perforations of boring insects, are crushed up and winnowed in the wind to separate the fragments of husks from the seeds. The seeds may then be put in water in order to separate the heavy from the light. Those that sink are dried, and are ready for immediate sowing.

Seeds sown in baskets this year germinated usually in five or six days, when kept moist. The seedlings should be well and regularly cared for, and will be ready for planting out in the open ground in about five months after germination. The holes should be prepared before planting, about 10 lb. of goat manure being put to each hole. A distance of about 16 feet between each plant every way will allow of maize being grown between. This lessens the cost of the first year's work, keeps the ground clear of weeds, shades the soil, and causes the young trees to grow straight. Any loss of plant food caused by the growth of the maize can be replaced by manuring. Starting with plants 16 feet apart, in a few years they will have grown so large that half of them must be cut out, alternately in each row. Some years later, when the trees have grown so as to fill the gaps, every alternate row must be cut out, and the remaining trees will be 32 feet apart. The cost of cutting out the trees is covered by their value for wood or charcoal.

Before planting out, it must be decided whether one plant or more are to be put in each hole. Many planters prefer three stems to one, as they are more able to withstand the force of the wind when young. The same result may be attained by propping the single trees. The three stems, however, quickly form a strong root system, and the crown of foliage quickly spreads to a large size. They also seem to give off lateral branches nearer the ground than when grown

singly, and this facilitates picking the pods; but unless goats are kept off, these animals destroy the low branches. Single trees may be made to branch at a low level by topping them.

A plantation of divi-divi may be made by sowing the seeds directly in the field; but the method of sowing first in baskets is better in the long run, though more expensive at first.

The divi-divi grows well in Curaçao on the fine black soil of the wide valleys; but when the valleys are dammed, so as to hold back the water, this soil becomes too moist, the trees grow very tall, and the number of pods is lessened. The lowest slopes of the mountains seem best suited for growing divi-divi. On the calcareous soils there are very few well-grown divi-divi trees.

A slight pruning may be useful for trees which regularly bear fair crops, and may consist in the cutting out of dead branches; but the natural wind screen of branches on the eastern side must be preserved.

The weight of pods from one divi-divi tree in Curaçao may be from 40 lb. to 80 lb. annually. Only fully ripe pods, picked from the tree, should be shipped as first quality, and all fallen pods should be classed as second quality.

In islands where there is a heavy rainfall the divi-divi does not seem to bear well. It is evidently suited to places which, like Curaçao, have a low rainfall.

A very interesting article on the tree and its products, by the late Mr. E. Cowley, manager of Kamerunga State Nursery in 1898, was published in this Journal in August, 1897 (Vol. I., Part 2).

COTTON-GROWING.

By DANIEL JONES.

As the 1907 cotton harvest, as far as Southern areas are concerned, is now at an end, it will perhaps be of practical advantage to recapitulate the results of the season's operations. The value of cotton-growing is best understood by a comparison of returns per acre and the value of the resulting crop.

The climatic conditions this past season have not been, on the whole, particularly on the coast, the most suitable for cotton. Excessive rain has, to some extent, retarded the growth of the shrub on coastal lands, but in the interior the season has been most favourable. In some instances, however, the coastal soils, where loose and well drained, have yielded well; not so, however, the soils that are retentive of moisture, which lowers the soil temperature, to the disadvantage of the crop.

The cotton shrub revels in warmth and sunshine; hence, locations where these conditions obtain are the most suitable; shade of hills, trees, or other crops is injurious. In the tropical North, however, the cotton plants now acclimatised to those regions do certainly thrive and give large returns, despite the very heavy rainfall they are subject to in the wet season.

The cotton shrub is most peculiar in this regard, as it will thrive luxuriantly in the humid North and in the dry Western plains.

The varieties coming to hand to Messrs. Kitchen and Sons' ginnery are principally Upland sorts. Next in quantity are the Caravonica types, grown chiefly in the North, and a minor quantity of Sea Island, grown on the Southern coast and on the Western inland country.

The qualities of each of these varieties are now well recognised, and the esteem in which they are held by spinners is indicated by the demand which exists for the raw material.

So far, the farmers' preference is for the Upland type, represented by Russell's Big Boll, which has given returns up to £11 per acre.

The Seabrook, a Sea Island type, although a cotton of a very superior class, and of a higher value, is still in the experimental stage, growers not having decided which is the most suitable to their lands. The Caravonica, again, midway in value between these sorts, claims the undivided attention of the Northern planter, with whom it is said to give very large yields.

It is thus clear that, although our experience in a general way conclusively proves the cotton crop to be one of the safest which farmers can engage in, there are many details in regard to selection of varieties which require close attention, and which will probably engage the activities of the Department of Agriculture. A very satisfactory feature of the season's work has been the interest taken in this pursuit by the State school teachers.

The institution of a number of prizes for awards to scholars and State school teachers for the best exhibit of three varieties of fibre at the National Association's show, caused a marked degree of interest in carrying out experiments in cotton cultivation. By this means many hundreds of scholars, and not a few farmers, have had practical lessons in cotton cultivation, and have familiarised themselves with types heretofore unknown to them. The exhibits as staged in the Education Department's court at the Exhibition showed that a very high class of cotton can be grown. The West End State School had undoubtedly the most attractive display, the exhibit being aranged with much taste. The judge, however (Mr. Bromily), after keen scrutiny, awarded the chief prize to a most excellent sample grown by Mr. Bradfield, the head teacher of the Wallumbilla State School. The exhibit from Ma Ma Creek and Milford also disclosed the fact that the soils of those districts were well adapted to the cotton shrub. In the open classes for long-stapled cotton, Mr. Kajewiski, of Ma Ma Creek, scored with a good sample of Seabrook. In the short-staple variety Mr. Showell, of the Deaf and Dumb Mission, ranked first, with a good sample of Russell's, grown on their plot of farm land at Montague road, Brisbane.

It is a matter for reflection when considering the adaptability of Queensland soils for cotton, and one to be pleased with, that cotton, as shown by the award cards, ranks in a high class, whether grown in the vicinity of Brisbane or in the more distant regions of the Maranoa. For the information of prospective growers, I herewith give a list of growers, and returns realised by them, from figures kindly furnished by Messrs. Kitchen and Sons, and based on the price of 1½d. per lb. on rail, the price paid during the season:—

FACTS WORTH NOTING.

The following are particulars of some yields of cotton harvested during 1907 season:—

	Area under Cotton.	Yield. Lb.	Value.	Value per Acre.
Mr. W. G. Giles, Wallumbilla ...	1⅖	2,240	14 0 0	10 0 0
Mr. W. Goos, Tallegalla ...	2¼	4,250	26 11 3	10 12 6
Mr. C. Pointing, Tallegalla ...	2	3,527	22 0 3	11 0 1
Mr. C. Litzow, Vernor	2	3,006	18 15 9	9 7 10
Mr. F. Baumann, Vernor ...	1¼	1,300	8 2 6	6 10 0
Mr. O. Adermann, Vernor ...	1	1,473	9 4 2	...

A Mackay farmer reports his yield from a small area equal to 1,368 lb. to the acre; value, £8 11s.

Among the numerous testimonies continually being supplied concerning this industry, a few brief extracts will, perhaps, indicate farmers' opinions on this question:—

Mr. C. Litzow, of Vernor, says "his cotton is a splendid paying crop, and was grown on light soil where maize will not grow well." He intends to sow several acres more next season.

Mr. T. Heaslop, Green View, Wondai, writes to Kitchen and Sons: "Your cheque for cotton received. I am very well satisfied with the return for the same. I will be sending for seed as soon as the frost is gone. I think Russell's does best here."

Mr. Giles, schoolmaster, near Wallumbilla, writes stating that his return is £14 from 14 square chains of land, the area being all tilled by hand, no horses or implements being used on the ground since the first ploughing.

Mr. Hargrove, an American cotton-grower, recently arrived and settled in the neighbourhood of Capella, in the Central district, and who is sowing extensively this coming season, writes:—"There is cotton in many of the yards here that has grown for years without care, and, in many cases, goats and cattle running among it, that seem better samples than ever I saw in America. Tell Mr. Jones he ought to come up. I think there is a fine chance to originate a new cotton here."

In confirmation of his opinion, Mr. Hargrove has sent along three very excellent samples of cotton of good length of staple—one a creamy fibre not frequently observed in Queensland. One sample is from a bush stated to be over fifteen years old. This fact indicates what degree of drought the cotton shrub will endure, as the plant in question must have survived the late disastrous drought. These three samples have a staple ranging from $1\frac{3}{8}$ to $1\frac{1}{2}$ inches in length, and are fine spinning sorts.

Mr. Iver Osmundsen, writing from the Bloomfield River, near Cooktown, speaking of his 6-acre crop of Caravonica, says: "This is an ideal spot for cotton-growing—a beautiful river with plenty of water, easy to get in and out with a lot of good land to back it up. All that is required is somebody to settle on it."

Surely there is room in Queensland for the landless man, if only to engage in this vocation.

One of the most practical of the experiments undertaken by the State school teachers is the very comprehensive and useful one detailed further on. Mr. Johns, the head teacher, has evidently given to the scholars at the Milford school practical instruction which will be much appreciated not only by the scholars for whose immediate benefit the experiment was undertaken, but also by the readers of this Journal, who will have in a very concrete form the detailed results of a very careful system of cotton cultivation. The point of major interest in the tables is the excellent record from the yield point of the Peterkin variety and Jones's Hybrid. Peterkin, so far, has not grown in favour with farmers, being in most districts outclassed in every way by Russell's, being rather faulty in strength of fibre. The experience here gained should indicate the value of intelligent experimentation. It may be yet demonstrated that certain soils with a varied climatic condition may suit one

variety as against another. The other item is the fact that the Sea Island variety gave a return of 1,300 lb. per acre. Valuing this class of cotton at about ½d. to ¾d. per lb. more than Upland, it seems that the cultivation of this long-staple cotton will pay best in some localities. In this connection, I may mention that on an experimental plot at Bulimba, of about a quarter of an acre, Messrs. Kitchen and Sons this season got a return of over 2,000 lb. of Sea Island cotton per acre. This yield has been very carefully verified.

The return per plant from Jones's Hybrid is very satisfactory—31 lb. from fifteen shrubs. This hybrid, wherever observed this season, is remarkable for its robustness, for the large size of the bolls, and for the yield of lint. In many instances a yield of from ¾ to 2 lb. per shrub has been obtained. The staple of this cross is much superior to the ordinary Uplands, but a little inferior to Sea Island. Its merit, so far, lies in its greater productiveness. However, it is too soon to say what value this hybrid may be to us, as until the cross is well established, as I hope it soon will be, it may be safest not to prophesy until we know:—

"State School, Milford.

"Dear Sirs,—With regard to the cotton forwarded to you from this school, I beg to state:—

"(1) We were rather unfortunate in striking poor weather for cotton—*e.g.*, at time of planting and for some time after the weather was very dry, while during the time that picking was going on rain fell so frequently as to spoil our chances of a heavy crop. Further, very early frosts were experienced, two sharp frosts being received in April.

"(2) About 250 Sea Island plants were planted, and 180 came to maturity.
900 Lewis Prize were planted, and 700 came to maturity.
900 Russell's Big Boll were planted, and 750 came to maturity.
900 King were planted, and 22 came to maturity.
900 Peterkin were planted, and 210 came to maturity.
30 Hybrid (Jones's) were planted, and 15 came to maturity.

"Kings and Peterkin were practically smothered with weeds and otherwise destroyed—calves from neighbour got into farm.

"Yield.—180 Sea Island plants gave 46 lb. = about 1,300 lb. per acre; counting 5,000 plants to acre.
700 Lewis plants gave 150 lb. = about 1,100 lb. per acre; counting 5,000 plants to acre.
750 Russell's Big Boll plants gave 155 lb. = about 1,050 lb. per acre; counting 5,000 plants to acre.
22 King's plants gave 6 lb. = about 1,360 lb. per acre; counting 5,000 plants to acre.
210 Peterkin plants gave 63 lb. = equal about 1,500 lb. per acre; counting 5,000 plants to acre.
15 Jones's Hybrid plants gave about 31 lb. = (about 1,000); no fair test.

"Owing to the way in which the weeds came on the new ground, we thought it unwise to put in our other cotton seeds, but intend to plant them in the coming season (varieties 'Culpepper' and Jones's 'Improved').

"Our existing plants we intend to prune, and we also intend to replace plants that have died or been destroyed.

"(3) I should be glad if we could get another couple of pounds of King's, as I believe from the fine samples we got from our few bushes, that if it had a fair trial it would prove a good variety for this district.

"(4) We have forwarded some of our best cotton to the Brisbane Exhibition—namely, 10 lb. each of Russell's Big Boll and Lewis Prize, and 5 lb. each of Sea Island and Peterkin. These are to compete for your trophies. We should be glad if you would take over these samples after the Exhibition.

"(5) Finally, I may say that as our farm of 1½ acres was cleared and fenced, and the cotton had to be planted, all after 12th July, by the children

and myself, the plants had hardly a fair test. But this year we shall have time to conduct our operations methodically and carefully, and hope to show a much better return next year.

"(6) I will add that our operations have been watched with keen and appreciative interest by the more progressive and intelligent farmers, and I believe that I have convinced more than one farmer of the wisdom of putting in a portion of his farm under cotton during the next season. We hope that the returns from our cotton will be sufficient to convert the most sceptical.

"I am, sirs,

"Yours faithfully,

"H. W. Johns, Head Teacher, Milford.

"Messrs. Kitchen and Sons, Eagle street, Brisbane."

One feature to our advantage in Queensland is the grand climatic conditions we have which are so suitable for the improvement of the cotton plant. In our most suitable regions, the shrub being perennial, it is comparatively easy to establish a type once selected.

One matter which it may be well to remind growers of is the prevalence of the cotton boll worm under certain conditions. In this Journal, a few months ago, much detailed information was given on the question of using trap crops for the safeguarding of the cotton plant from the ravages of the boll worm and other borers.

That the cultivation of green crops in the vicinity of the cotton plot, such as maize, Kafir corn, peas, &c., is a sound one, local experience, in addition to American, is agreed upon.

As the sowing of these trap crops entails no great cost or inconvenience, it is advisable when sowing cotton to give some attention to this matter, very full details of which have been given in the journals indicated (April, May, June, 1907).

Southern planters should, if possible, get their sowing completed during September and October; if later than this, the shortening of the season will lead to loss by reason of cold or frost arriving before the shrub reaches maturity. In the Central and Northern areas, where the frost is not a factor of the question, later sowing will prove successful.

Those farmers who contemplate engaging in the pursuit should at once write to Kitchen and Sons for such seed—either of Upland or Sea Island varieties—as they prefer to grow, and is supplied free.

Regarding the distance apart of plants, there is a tendency to leave the shrubs too thinly in the row. This season several planters have told me they thinned out to 2 feet 6 inches in the drill. This leaves over 1,500 less plants per acre less than if left 4 feet by 20 or 24 inches in the drill. The reason usually given for the wider planting is, that the bushes interlace so much. This will happen more or less in accordance with the season and the rate of growth of the shrub, dependent as it is on moisture and sunshine.

The Bounties Bill, having passed the Federal House of Representatives, providing, as it does, a bonus of 10 per cent. on the value of cotton and seed, will, if safely piloted through the Senate, as it most probably will be, serve to call further attention to the value of the cotton crop to the grower. The added increment from this source will be to the grower from 15s. to 20s. per acre, a further encouragement to embark in the industry.

COTTON NOTES.

Nep in Cotton.

At the apex of each cotton seed there is always to be found a number of flat fibres with extremely thin walls, while the other fibres on the seed have thick walls and a twisted appearance. These flat, thin-walled fibres are very weak, and are differentiated from the good fibres by being called "weak fibres."

"Nep" in cotton is caused by the presence of these weak fibres; they curl up and wrap themselves around the good fibres, and are seen as white specks when fibres are drawn out of a handful of cotton lint.

Cotton in which much nep is found is "wasty," and when the lint is passing through the combing machine in the factory the nep is taken out as waste. This is not all, for the good fibres around which the weak ones have twisted themselves are also taken out with the nep.

In cotton seed selection experiments great importance should be attached to the amount of weak fibres, for the production of a cotton with the lowest possible quantity of such fibres, together with other desirable characters, should be the aim of all selection experiments.

The proportion of weak fibres varies considerably in the cotton obtained from different plants, and by selecting seed from those which have produced cotton containing the smallest quantity of weak fibres it is hoped to produce a superior cotton of uniform quality.

A WHITE-FLOWERED COTTON PLANT.

A cotton plant was recently observed in a field at Barbados which was particularly noticeable on account of its flowers being almost white. The plant was marked, and the seed cotton when picked was kept separate. The lint, however, was not of a desirable quality, being short and very coarse. This is an instance showing how a plant can develop a character very different from the rest of the plants in the same field. In this particular case the variation is valueless, but instances may occur in which the variation may prove to be a most valuable one.

CLEAN, BLACK COTTON SEEDS.

Since the publication of an article on the selection of cotton seed ("Agricultural News," Barbados, Vol. VI., p. 118), in which it was pointed out that all clean, black seeds should be discarded in the hand selection, as the lint which is obtained from them is of an inferior quality, the following facts have been obtained:—

Three samples of seed cotton with clean, black seeds, taken from three separate plants, have been received and examined by this Department, and it has been found that the proportion of weak fibres in these samples is very high.

A good sample of cotton should never contain more than about 27 per cent. of weak fibres, and often samples are found which contain only 19 or 20 per cent.

The samples of seed cotton with clean, black seeds gave 48·4, 43·7, and 43 per cent. respectively; and when it is remembered that the strength of weak fibres, compared with strong fibres, is only as 1 is to 3 ("West Indian Bulletin," Vol. VII., p. 163), and that almost all discarded waste in the spinning factory is caused by these fibres, the importance of keeping out seeds bearing a large percentage of weak fibres from those selected for planting purposes is recognised.

COTTON STALKS FOR PAPER.

Paper manufactured from the cotton stalk is of the strongest texture and softest finish. It is reported that several plants will be erected during the next few months in certain American States. The practical effect of this new invention will be to increase the present value of the cotton crop nearly £20,000,000 sterling annually.

The bulk of the material going into the manufacture of paper at the present time is spruce pine, which is annually becoming more expensive, owing to depletion of the forests. The utilisation of a waste product such as the cotton stalk, manufactured into commercial paper, will be a boon of inestimable value to the world. It will check the present increasing cost of paper, which is becoming such a burden upon the newspaper industry.

Mr. Harvie Jordan, president of the Southern (U.S.A.) Cotton Association, declares that the manufacture of paper from the fibre of the cotton stalk is one of the latest and most interesting inventions of the new century. Not only have the investigations passed the experimental stage, but they are rapidly being shaped to be placed into practical operation. Mr. Jordan says it has been unquestionably demonstrated that all grades of paper, from the best form of linen to the lowest "news," can be manufactured from the new material.

AMERICAN COTTON CROP FOR 1907-08.

With regard to the acreage for the new American cotton crop, Messrs. Neill publish a detailed comparison of the estimates of the Bureau and the "Chronicle" showing that, although the difference in the total is only about 1,000,000 acres, or, say, 3 per cent., the estimates for individual States differ hopelessly. Thus, the Bureau estimate is the larger by nearly 24 per cent. in North Carolina, 8 per cent. in Georgia, and 20 per cent. in Tennessee, &c., whilst the "Chronicle's" is the larger by 35 per cent. in Alabama, 14 per cent. in Mississippi, 16 per cent. in Florida, and 3 per cent. in Texas. The higher estimates of the two sets added together amount to 34,125,000 acres, whilst the lower estimates, by States, amount only to 31,014,000 acres—a discrepancy of about 10 per cent. Messrs. Neill adhere to their forecast of 33,000,000 acres, made on 14th May, which, on the basis of the minimum and maximum yields per acre during the last ten years, would indicate for 1907-08 a crop range of from 11,500,000 to 15,500,000 bales, or, with an average production per acre, about 13,500,000 bales. They admit, however, that the crop has been very materially delayed by adverse weather, and that a long maturing and picking season will be necessary to ensure a good result. In this connection we may note that Messrs. Bashinsky and Co., of Troy, Alabama, writing on 1st June, affirm that the acreage has not been reduced on account of the necessity for replanting, and that, in spite of all adverse conditions up to this time, it is too early to predict a short crop. They say that "most of the March plantings (about 25 per cent. of the crop) have successfully withstood the cold rains, and have made fairly good growth. The greater portion of the crop was planted in the first half of April, all of which was ploughed up and replanted. The whole country was threatened with a seed famine, but with prices of cotton ranging from 11 to 12 cents in the interior farmers doubled their energies in search for seed, and, as far as we can ascertain, everyone has secured a full supply. Chopping of cotton is practically completed; the more thrifty farmers seeded the vacant spots while chopping was in progress."—"Indian Trade Journal."

VALUE OF LIME IN TOBACCO CULTURE.

HOW ONE NEW ENGLAND GROWER IMPROVED QUALITY OF TOBACCO BY FOLLOWING DEALER'S ADVICE.

Some New England packers of tobacco have been complaining of the poor burning qualities of many of the 1906 crops which they have bought, to such an extent that the "New England Homestead" has been impelled to print the following suggestion of a dealer that brought good results:—

"I find that too many growers do not use enough lime on their tobacco. The other day I sold a fine lot of wrappers at a big discount simply because the leaf burned a reddish-brown colour instead of white. A crop was offered me in 1905, and I finally took it at 10 cents per lb. I told the grower I would buy of him again if he would use lime on his field. He did so, and I gave him 19 cents for his 1906 tobacco. It's a safe proposition that he will stick to lime hereafter. I would advise as high as 1,200 lb. of lime per acre on land deficient in that element. The 300 lb. suggested by some authorities is a mere drop in the bucket. Where a liberal quantity is used it may be omitted every other year."—"Western Tobacco Journal," 8th July, 1907.

Science.

THE ELIMINATION OF TUBERCULOSIS.

INTERESTING EXPERIMENTS IN IMMUNISATION.

Mr. William O'Leary, of Wattle Glen, Gundiah, N.C. Line, sends us the following interesting article on the above subject, culled from the "World's News":—

Of far more importance, in the opinion of all who have watched Dr. Leonard Pearson's experiments in immunising cattle from tuberculosis, than the saving of millions of dollars' worth of cattle every year is the effect of his discoveries on the treatment of tuberculosis in man. Not only has the University of Pennsylvania officially announced the discovery of an absolutely certain preventive of tuberculosis in cattle, but every test so far made confirms the belief that very soon human beings can be made immune to the "great white plague." The experiments with the cattle having been entirely successful since their beginning in 1900, Dr. Pearson is now continuing his experiments with monkeys, with results equally gratifying. The next step will be to apply the same methods to human beings, and it is not doubted that success will follow.

Dr. Pearson is dean of the Veterinary Department of the Pennsylvania State Veterinary Bureau, and Assistant Director of the Henry Phipps Institute for the Study, Prevention, and Treatment of Tuberculosis. In the experiments with monkeys now underway, Dr. S. M. Dilliland is associated with Dr. Pearson.

"The results of the vaccination of monkeys are most encouraging," said Dr. Pearson. "They are a link in the chain of experiments which have the immunisation of man from tuberculosis as their object.

"What the result of vaccination of cattle is we know absolutely. It is perfect immunisation where the cattle are not diseased, and arrest of the tuberculosis where the disease has been contracted.

"We have reasons to believe that the same result will be achieved through the vaccination of tuberculous monkeys. What the result will be when we come to apply the treatment to man, I will not venture to predict."

The serum which produces immunisation has its origin in living tubercles from the body of man. Cultures have been made and propagation has taken place in flasks of glycerine veal broth.

The attenuated, enfeebled bacilli which are used in vaccination are exactly 200 generations removed from their virulent parent germs. As fast as reproduction takes place in one flask the new growth is removed to another, and a third generation is reared. So the process continues, until 200 removals have been made from flask to flask. Cultures which are taken after the two-hundredth reproduction are made ready for injection. They are taken from the surface of the glycerine veal broth in the form of a film which in its cohesiveness and toughness resembles a bit of skin. The film is then placed in a flask in which are a number of iron balls. This flask is shaken violently, and the film is broken and ground into powder.

The substance thus obtained is diluted in a normal salt solution, the proportion of salt being four-tenths of 1 per cent., and is then ready for use. The method of preparing the vaccination fluid, while tedious, and requires expert handling and constant care, is not costly.

It is estimated that £400,000 worth of cattle a year will be saved in Pennsylvania alone by the Pearson treatment, and that its application to the whole of the United States will mean a saving of more than £200,000,000.

Trained experts have begun the work of vaccination in that State. Enough serum has been prepared to keep them busy for months.

Other States are to be provided with immunising serum as fast as the cultures can be made. It is likely that distribution will be made through the State Department of Agriculture to other agricultural departments, and that arrangements will be made for the instruction of the veterinarians and bacteriologists of other States by Dr. Pearson and his assistants.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.						1907.						
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.
North.													
Bowen	0·04	0·36	3·41	1·76	0·99	11·01	2·53	3·74	1·97	0·39	3·46	2·87	Nil
Cairns	2·28	1·79	1·57	0·56	13·26	11·31	18·36	11·49	3·26	3·35	8 65	4·45	0·12
Geraldton	5·73	6·65	4·26	2·28	21·08	21·20	29·58	25·26	4·58	6·08	21·91	8·54	2·39
Herberton	0·59	0·55	0·38	0·30	5·16	10·82	10·56	11·77	2·05	0·90	1·57	2·71	Nil
Hughenden	Nil	Nil	0·92	0·61	0·51	4·76	1·98	3·83	1·17	0·16	1·34	0·95	1·16
Kamerunga State Nurs.	2·49	2·03	2·56	0·72	10·00	8·17	15·78	14·82	4·87	2·80	9·33	5·29	0·13
Longreach	0·11	Nil	4·11	2·16	0·66	0·51	1·22	0·49	1·88	0·85	0 93	0·40	0·49
Lucinda	0·40	...	Nil	1·85	6·60	*22·36	12·38	23·82	4·53	3·92	19·29	6·34	0·29
Mackay	0·68	0·93	4·35	2·63	1·80	12·93	2·72	6·42	8·01	1·58	6·09	*5·04	*0·27
Rockhampton	Nil	2·61	3·80	1·07	0·46	5·19	4·15	4·42	3·05	0·44	0·94	4·16	0·84
Townsville	Nil	0·46	3·25	1·45	7·74	14·03	12·49	7·75	7·37	1·03	3·11	2·38	Nil
South.													
Barcaldine	0·10	Nil	2·88	2·92	1·33	1·04	3·44	0·43	1·51	0·82	0·34	2·03	0·87
Beenleigh	0·16	2·94	3·47	2·94	1·75	3·98	4·75	3·88	4·17	0·58	4·70	4·92	0·71
Biggenden State Farm	0·48	3·02	5·07	1·19	3·09	4·55	5·77	3·55	10 91	0·34	4·02	5·24	1·51
Blackall	0·48	0·02	4·70	5·86	1·37	1·96	2·30	Nil	2·78	1·69	0·20	*0·36	1·36
Brisbane	0·22	4·21	3·48	3·81	1·07	3·28	2·69	5·23	5·32	0·45	4·75	2·91	0·39
Bundaberg	0·03	1·86	10·90	1·57	0·97	3·85	3·29	3·90	12·81	0·38	3·08	4·49	0·87
Caboolture	0·29	3·02	4·77	4·73	4·26	3·15	2·53	8·03	*9·04	0 78	3·10	4·98	0·73
Charleville	2·34	0·35	4·99	2·66	1·30	3·71	0·85	Nil	2·75	2·29	0·26	0·90	1·04
Dalby	1·58	2·78	2·65	2·96	2·12	5·67	5·60	1·34	3·72	0·20	2·26	2·35	0·87
Emerald	Nil	1·62	4·47	1·55	2·32	1·79	7·36	3·67	7·66	Nil	Nil	2·53	1·75
Esk	0·38	4·51	4·14	2·90	2·45	5·26	2·87	6 79	3·60	0·22	5·42	2·66	0·54
Gatton Agric. College	0·41	3·73	3·54	2·25	2·01	3·45	2·62	6·44	2 71	Nil	2·80	1·85	0·54
Gayndah	0·22	2·34	5·14	2·25	4·25	2·82	3·00	1·91	6 89	Nil	2·65	3·00	1·21
Gindie State Farm ...	Nil	1·46	4·57	3·20	2·95	1·45	6·13	0·71	10·10	Nil	Nil	*2·29	1·58
Goondiwindi	0·49	4·35	3·33	2·36	2·32	4·04	5·37	1·77	6 51	0·33	1·30	1·09	1·62
Gympie	0·52	3·19	3·97	3·03	4·12	5·32	3·99	6·96	8 93	1·12	3·84	3·77	0·80
Ipswich	0·17	2·59	2·94	2·60	0·71	4·22	2·17	5·38	1·95	0·12	3·43	2·22	0·30
Laidley	0·50	3·26	3·19	2·87	1·78	4·12	2·84	4·50	3·47	Nil	2 99	1·56	0·45
Maryborough	0·15	2·31	6·48	1·22	2·49	4·39	5·52	7·84	10·28	1·25	3·21	6·05	0·64
Nambour	0·61	4·52	8·94	4·89	3·40	6 74	5·74	12·05	13·30	1·36	4·54	6·96	1·08
Nerang	0·12	3·56	6·42	8·26	2·75	6·33	9·86	6·04	7·83	1·48	7·74	5·08	1·26
Roma	1·65	1·47	4·43	2·37	1·32	4·31	6 32	2·92	1·87	0·42	0·27	2·47	1·03
Stanthorpe	1·44	3·37	4·29	2·90	2·49	4·89	4·33	3·30	5·98	1·68	1·79	2·44	1·06
Tambo	0·67	0·07	5·17	2·85	1·23	1·16	4·74	1·41	3·58	3·69	0·11	0·89	1·42
Taroom	0·60	2·30	4·26	1·70	1·35	5·49	5·16	1·10	1·86	Nil	1·01	3·76	0·70
Tewantin	0·39	4·25	6·37	4·38	2·73	9 53	6·38	15·83	11·45	1·87	7·16	7·61	1·48
Texas	0·90	3·22	2·77	3·42	2·23	1·83	4·69	4·55	6·16	0·65	0·93	1·62	1·31
Toowoomba	1·81	3·63	4·55	2·76	2·65	4·11	3·94	4·00	4·81	0·01	4·61	3·34	0·78
Warwick	1·16	3·85	3·13	2·47	2·99	5·50	3·95	2·52	5·71	0·51	1·58	1·27	1·16
Westbrook	1·67	2·80	3·34	3·41	1·79	1·48	1·79	2·91	5·13	0·02	2·53	2·53	1·04

* Compiled from telegraphic reports.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

CHEAP PAINT.

Skim milk, mixed with ordinary cement to the consistency of house paint. Apply in the usual way.

TO PROTECT GALVANISED-IRON TANKS FROM OXIDISATION.

Mix linseed oil and cement to the consistency of paint, and apply like ordinary paint.

PUBLICATION RECEIVED.

"The Weeds and Suspected Poisonous Plants of Queensland," by F. Manson Bailey, F.L.S., Colonial Botanist. The voluminous writings on an infinity of subjects in connection with Botanical Science, which have emanated from the pen of Mr. F. M. Bailey, Queensland Colonial Botanist, are too well known to and appreciated by botanists all over the world to need any criticism by laymen. Mr. Bailey's splendid work, "The Flora of Queensland," in six volumes, highly illustrated, alone would be sufficient to place him in the highest rank of scientific botanists, not to mention the innumerable pamphlets he has published and the various articles on botany he has contributed to local and foreign journals. The book under notice derives its great value from many points. It recommends itself to the largest stockholder as well as to the humblest market gardener, for each is interested in a knowledge of the poisonous properties of weeds found in all classes of land. The information contained in the book and the botanical descriptions of the economic, noxious, and other properties of the plants or weeds, as well as the figures illustrating portions of the plants brought under notice, should also be very helpful to teachers in giving object lessons to their pupils on roadside plants and fruits. One lesson Mr. Bailey teaches in the prefatory note is of peculiar interest and significance, and we, therefore, give it in full, as it will to a great extent conduce to the peace of mind of those who fear to see new plants introduced into the State, on the ground that they might eventually become a pest. On this point Mr. Bailey writes:—

It is worthy of remark that climate has much to do with the kinds of weeds which infest the soil of a State or country. This is plainly evident in extra tropical Queensland. Plants from parts of America, India, and countries of a somewhat similar climate thrive, and when of a seedy character spread with rapidity, both far and wide, while plants of the cooler States of Australia and New Zealand, as well as South Africa, are so shy that it requires the greatest of care to keep them alive, even in the garden; some, however, may grow pretty freely in such favourable situations as from Warwick to the border of New South Wales, and also in some places on the Darling Downs, but never on the coastal side of the range, where they may be met with as introductions through imported hay or packing. They grow during winter, if it is damp, ripen their seed, and people are afraid that a certain weed will become the pest here that it is in the Southern States, but they have only to wait. The seed is formed, dropped into the ground, and there waits for the next winter; our usual hot, damp weather of February comes along, the seeds germinate, and, while in the cool or cold damp they can grow and thrive, our hot damp is death to them; thus it is seen there is no seed left in the ground to furnish a pest for the coming winter. The same climatic conditions prevent the spread of some of the bulbous pests of the Southern States.

QUEENSLAND AGRICULTURAL COLLEGE EX-STUDENTS' CLUB.

Annual Meeting.

The annual general meeting of the above association was held in the Board Room, at the Department of Agriculture and Stock, on Friday, 16th August. The chair was taken by Mr. H. C. Webb.

The minutes of the previous meeting were read and confirmed. It was unanimously decided to forward letters of condolence conveying the sympathy of the members to Messrs. P. McLean and Norman Philp in their bereavement.

On the motion of Mr. Corser, seconded by Mr. Webster, a hearty vote of thanks was accorded to Mr. J. P. Orr, Deputy Chief Inspector of Stock, for presiding at the annual dinner on the previous evening.

Mr. Dixon proposed that the club challenge the present College students to a game of football (Rugby), to be played during Exhibition week in 1908. This was seconded by Mr. G. McDonald, and carried. On the motion of Mr. Corser, seconded by Mr. Nuttall, Mr. Dixon was appointed to select the club team and make all necessary arrangements.

The election of officers was next proceeded with. Mr. Corser moved that the Hon. T. O'Sullivan, M.L.A., be requested to become patron of the club. This was seconded by Mr. Murray-Prior and carried with acclamation.

Moved by Mr. Corser, seconded by Mr. Rochat, that Messrs. McGrath, Bailey, and Tucker be appointed vice-presidents.—Carried.

It was resolved that the present office-bearers be re-elected for the following year:—Patron, the Hon. T. O'Sullivan, M.L.A., Secretary for Agriculture; President, John Mahon, Principal of the Queensland Agricultural College; Vice-presidents, E. G. E. Scriven, Under Secretary, Department of Agriculture and Stock; J. C. Brünnich, Agricultural Chemist; J. P. Orr, Chief Clerk, Department of Agriculture and Stock; E. H. Quodling, Inspector of Agriculture; P. McLean, late Agricultural Adviser; P. M. Pitt, E. H. Gurney, G. B. Brookes, G. Tucker, J. McGrath, and J. F. Bailey. Committee: Messrs. H. C. Webb, H. B. Corser, P. Rochat, J. Devereaux, N. Dixon, J. Nuttall, D. Binnie, R. McDonald, A. Webster, R. S. Harvey, McLay, and Colin Philp. Hon. Secretary and Treasurer: A. J. Boyd.

On the motion of Mr. Corser, seconded by Mr. Rochat, it was resolved that the next annual dinner be held on Thursday, in Exhibition week, 1908, at the Café Eschenhagen.

A vote of thanks to the secretary was proposed by Mr. Webb, and seconded by Mr. Burns, and carried unanimously, the members present expressing their regret that Major Boyd's illness had prevented him from being present at the dinner and meetings.

The following subscriptions have been received since 1st August, 1907:—R. A. MacKellar, Agricultural Chemist's Department; G. R. Robertson, Toowoomba; J. Devereaux, Wahroonga, Beaudesert (previously credited in error to A. Smart); R. MacDonald, Miriam Vale; D. W. Shine, Fernvale; G. F. Campbell, Greenmount; E. A. Byrne, Kangaroo Point; B. H. Corser, Wetheron; P. Rochat, Wallumbilla; L. Elcock, Beaudesert; R. S. Harvey, Carisbrook, Allora; H. J. Dixon, Blackall Range; J. Conachan, Kabra, Rockhampton; A. H. Webster, Blackall Range; A. McNab, Wyalong, Booval; D. Binney, Wyalong, Booval; Archie Brown, Roma. Subscriptions paid to 1908: J. O. Murray-Prior, Roma; J. Devereaux, Wahroonga; E. P. Noakes, Childers (10s.); H. J. Dixon, Blackall Range; R. H. Bentley, Toorbul Point, Caboolture; R. Macdonald, Miriam Vale; J. W. Nuttall, Rockhampton Co-operative Dairy Company; H. C. Webb, Ipswich (5s. each); R. S. Harvey, Carisbrook, Allora; E. A. Byrne (omitted in August notice), 5s.; A. E. Andersen, Mackay, 5s. Per Mr. J. Mahon:—T. E. Handcock, Prospect Hill, Walloon; N. G. Walker, Bingera Cattle Station; W. Wilkie, Bingera Cattle Station; P. M. Bayley, Dairy Company, Pittsworth; R. S. Taylor, Q. A. College; L. R. Fudge, Townsville, 5s. each.

Answers to Correspondents.

CLOTH MANUFACTORY, ETC.

ENQUIRER.—(?)

We have repeatedly declined to answer anonymous correspondents. The name of the correspondent is required not for publication unless desired, but that, if necessary, we may communicate with him or her. You ask about an important cloth manufactory, spray pumps, and grape vine clippers. We can only refer you to advertisements in the daily journals.

TO REMOVE THE HAIR OR FUR FROM SKINS.

W. R. WILSON, Fernvale, Roma.—Place the skins in a fairly strong solution of lime.

PRESERVING EGGS IN LIME WATER.

HENWIFE, Degilbo.—

Yes, eggs will keep for twelve months in properly-prepared lime water. The lime water is prepared by slacking 1 lb. of freshly burnt quicklime with a small quantity of water; the milk of lime so formed is stirred into 5 gallons (50 lb.) of water. After the mixture has been kept well stirred for a few hours, it is allowed to settle. The supernatant liquid, which is now saturated lime water, is drawn off and poured over the eggs previously placed in a crock or water-tight barrel. As exposure to the air tends to precipitate the lime (as carbonate), and thus weaken the solution, the vessel containing the eggs should be kept well covered. The air may be excluded by a covering of sweet oil or by sacking, upon which a paste of lime is spread. If after a time there is any noticeable precipitation of the lime, the lime water should be drawn or siphoned off, and replaced with a further quantity newly prepared. The eggs should be completely immersed throughout the whole period of preservation. Although not necessary to the preservation of eggs in a sound condition, a temperature of 40 degrees Fahr. to 50 degrees Fahr. will no doubt materially assist toward retaining a good flavour, or rather in arresting that "stale" flavour so characteristic of packed eggs.

SCOURS IN CALVES.

DAIRY FARMER, Jondaryan.—

Would dairy farmer please forward the internal organs of a sick animal a week old and also of one six months old to the Departmental veterinary surgeon? The organs as soon as removed should be packed in a box or tin with dry salt, and immediately despatched. It is advisable to kill the animal when in a dying condition, as if the animal has died before the organs are removed the latter are generally too decomposed for examination.

Sulphur does not keep cattle clean from ticks if given to them in their food.

[We again draw attention to anonymous writing. In future we shall decline to answer any questions not bearing the signature and address of the inquirer.—Ed. "Q.A.J."]

CONTENT OF A STACK.

VICTORIAN, Darling Downs.—

We presume that you mean an oblong stack. In that case, where the sides of such are perpendicular, the measuring process is simplified, and the formula is length by breadth by height from the ground to halfway between the crown and the level of the eaves. The multiplication of the length, breadth, and height to the eaves gives the contents of the body of the stack, leaving the roof unaccounted for. The contents of this are found by the multiplication of the length and breadth of the eaves, which is in this case the same as at the ground, and half the height of the crown above the eaves. Of course, this latter measurement is taken on the perpendicular from the crown to a line stretched across from the eaves at the end of the stack, and *not* half of the *slope* from the crown to the eaves. When the results of these two processes are added together it gives you the whole volume of the stack, or the same result is given in one operation, taking the height to halfway from the crown to the eaves, as stated at the beginning. For example, if a stack is 40 feet long, 12 feet wide, 8 feet high to the eaves, and 6 feet high from the eaves to the crown, the volume of the stack will be in feet 40 by 12 by (8 by $\frac{1}{2}$ of 6), which means 40 by 12 by 11—eq. 5,280 cubic feet—eq. 195$\frac{5}{9}$ cubic yards. This will give a rough approximate to the contents of any oblong stack. It will not be altogether accurate, however, in the case of stacks that bulge at the eaves. In this case the volume of the roof is obtained as explained above. The volume of the body of the stack is obtained by taking the average, not that at the ground, and using the formula given above. For example, suppose a stack is 40 feet long by 12 feet broad at the ground, and 14 feet broad at the eaves, the height to the eaves is 9 feet, and the end of the crown from the eaves 8 feet. First, taking the body of the stack, the average breadth will be 13 feet, and the volume 40 by 13 by 9—eq. 4,680 cubic feet. The volume of the roof will be 40 by 14 by 4—eq. 2,240 cubic feet. Adding these two volumes together, the total contents of the stack are 6,920 cubic feet, or 256$\frac{1}{3}$ cubic yards, there being 27 cubic feet in a cubic yard. The weight of a cubic yard varies considerably, but 10 cubic yards to the ton is a fair average for hay well settled. On old compact stacks 8 yards will make a ton, while in new stacks 12 yards.

SEEDLING SUGAR-CANES IN THE WEST INDIES.

From the "Agricultural News," Barbados, we learn that the cultivation of new seedling sugar-canes, as compared with the Bourbon and other varieties hitherto grown in British Guiana and elsewhere in the West Indies, shows considerable progress in recent years. From returns to hand it appears that 28,801 acres were planted in British Guiana in seedling canes in 1906-7. The area in 1905-6 was 14,743 acres, and 1904-5 9,518 acres. Amongst the more important seedling varieties are the Demerara seedlings D. 109 and D. 625; while two Barbados seedlings, B. 208 and B. 147, are also largely cultivated. It is pointed out that an editorial note which appeared in the "International Sugar Journal" in May last (pp. 219, 220), discussing the "Identity of Seedling Canes in Demerara," and stating that it was "an ascertained fact that the seedling cane D. 208 cultivated on the well-known Diamond Plantation in Demerara was not the original seedling of that variety," is absolutely without foundation. Samples of B. 208 from Diamond Plantation have since been submitted to a critical examination by the Imperial Department of Agriculture for the West Indies, and it is stated that they are identical with the original seedlings of that variety raised at Barbados.

Times of Sunrise and Sunset at Brisbane, 1907.

DATE.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·4	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·3	5·34	5·28	5·48	4·58	6·6	4·46	6·28
3	6·2	5·34	5·27	5·48	4·57	6·6	4·46	6·29
4	6·0	5·35	5·26	5·49	4·57	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6·8	4·46	6·31
6	5·58	5·36	5·24	5·49	4·55	6·8	4·46	6·31
7	5·57	5·36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·22	5·51	4·54	6·10	4·46	6·33
9	5·55	5·37	5·21	5·51	4·53	6·11	4·46	6·33
10	5·54	5·38	5·20	5·52	4·53	6·11	4·47	6·34
11	5·53	5·38	5·19	5·52	4·52	6·12	4·47	6·35
12	5·52	5·38	5·18	5·53	4·51	6·13	4·47	6·35
13	5·50	5·39	5·16	5·53	4·51	6·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·51	6·14	4·47	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·47	5·40	5·13	5·55	4·50	6·16	4·48	6·38
17	5·46	5·41	5·12	5·55	4·49	6·17	4·48	6·39
18	5·45	5·41	5·11	5·56	4·49	6·18	4·49	6·39
19	5·44	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·48	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·41
23	5·39	5·43	5·6	5·59	4·47	6·22	4·51	6·42
24	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·42
25	5·36	5·44	5·5	6·0	4·47	6·23	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·24	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·25	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·26	4·54	6·44
30	5·31	5·47	5·0	6·4	4·46	6·27	4·55	6·45
31	...	...	5·0	6·4	...	...	4·56	6·45

PHASES OF THE MOON.

			H.	M.
8 Sept.	●	New Moon	7	4 a.m.
15 ,,	☾	First Quarter	1	40 p.m.
22 ,,	○	Full Moon	7	34 a.m.
29 ,,	☽	Last Quarter	9	37 p.m.
7 Oct.	●	New Moon	8	21 p.m.
14 ,,	☾	First Quarter	8	2 ,,
21 ,,	○	Full Moon	7	16 ,,
29 ,,	☽	Last Quarter	5	51 ,,
6 Nov.	●	New Moon	8	39 a.m.
13 ,,	☾	First Quarter	3	14 ,,
20 ,,	○	Full Moon	10	4 ,,
28 ,,	☽	Last Quarter	2	21 p.m.
5 Dec.	●	New Moon	8	22 p.m.
12 ,,	☾	First Quarter	0	16 ,,
20 ,,	○	Full Moon	3	55 a.m.
28 ,,	☽	Last Quarter	9	10 ,,

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	ROCKHAMPTON.		TOWNSVILLE.		COOKTOWN.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
September 1 to 22	9 m.	11 m.	24 m.	30 m.	27 m.	35 m.
,, 23 to 30	10 m.	10 m.	28 m.	26 m.	32 m.	30 m.
October	12 m.	8 m.	32 m.	22 m.	38 m.	24 m.
November ...	16 m.	4 m.	40 m.	14 m.	50 m.	12 m.
December ...	18 m.	2 m.	44 m.	10 m.	55 m.	7 m.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	AUGUST. Prices.
Apples, Eating, Local, per packer	4s. 6d. to 8s.
Apples, Cooking, Local, per packer	4s. to 7s. 6d.
Apricots, Local, per packer	...
Bananas, Local, per dozen	...
Bananas, Local, per bunch	6d. to 1s.
Bananas, Fiji, per case	...
Custard Apples, per quarter-case	2s. 6d. to 4s.
Cape Gooseberries, per quart	...
Grapes, per lb.	...
Lemons, Local, per packer	2s. 6d. to 6s.
Mandarins, Local, per packer	2s. 6d. to 4s. 6d.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges, per packer	2s. to 3s.
Papaw Apples, per case	...
Passion Fruit, per quarter-case	...
Peaches, per case	...
Peanuts, per lb.	2½d. to 2¾d.
Pears, Imported, per case	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	4d. to 2s. 4d.
Pineapples (smooth leaf), per dozen	1s. 6d. to 4s.
Plums, quarter-case	...
Quinces, per case	...
Rockmelons, per dozen	...
Rosellas, per bag	1s. to 1s. 3d.
,, per quarter-case	6d. to 9d.
Strawberries, per tray	...
Tomatoes, per quarter-case	1s. 6d. to 2s. 6d.
Watermelons, per dozen	...
SOUTHERN FRUIT MARKET.	
Apples, Tasmanian, per case	...
,, Other, per bushel case	...
Bananas, Fiji, per case	13s.
,, ,, per bunch	4s. 6d. to 8s.
,, Queensland, per case	4s. 6d. to 6s.
,, ,, per bunch	6d. to 1s. 6d.
Chillies, per bushel	...
Grapes, per box	...
Lemons, Ordinary, per gin case	...
Loquats, per box	3s. to 7s.
Mandarins and Navels, Queensland, per case	6s. to 7s. 6d.
Oranges, local, per case	10s.
,, Queensland, per case	3s. to 4s. 6d.
Pears, Victorian Vicars, per box	...
Persimmons, per half-case	...
Pineapples, per case	5s. 6d.
Passion Fruit, per gin case	2s. 6d. to 3s. 6d.
Quinces, per gin case	...
Strawberries, per dozen punnets	...
Tomatoes, Queensland (coloured), per gin case	3s. to 3s. 6d.
,, ,, (green) ,,	2s. to 2s. 6d.
Watermelons, Queensland, per dozen	...
,, medium	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR AUGUST.

Article.		AUGUST. Prices.
Bacon (Pineapple)	lb.	8d. to 9½d.
Barley (Malting)	...	...
Bran	ton	£4 5s. to £4 8s. 9d.
Butter, Factory	lb.	10½d.
Chaff, Mixed	ton	£4 5s. to £4 15s.
Chaff, Oaten	"	£4 5s. to £4 10s.
Chaff, Lucerne	"	£4 5s. to £5 5s.
Chaff, Wheaten	"	£3 2s. 6d.
Cheese	lb.	7½d. to 8d.
Flour	ton	£9 10s.
Hay, Oaten	"	£5 10s. to £5 12s. 6d.
Hay, Lucerne	"	£3 to £3 17s. 6d.
Honey	lb.	1¾d. to 2d.
Maize	bush.	1s. 7d. to 2s. 8d.
Oats	"	3s. 3d.
Pollard	ton	£4 15s. to £5.
Potatoes	"	£3 to £5 10s.
Potatoes (Sweet)	"	...
Pumpkins	"	...
Wheat, Milling	bush.	...
Wheat, Chick	"	3s. 3d. to 3s. 9d.
Onions	ton	£4 5s. to £5
Hams	lb.	10½d.
Eggs	doz.	8d. to 9½d.
Fowls	pair	2s. 1d. to 3s. 7d.
Geese	"	...
Ducks, English	"	3s. 3d. to 3s. 10d.
Ducks, Muscovy	"	3s. 6d. to 4s. 6d.
Turkeys, Hens	"	5s. 9d. to 6s. 9d.
Turkeys, Gobblers	"	9s. 6d. to 12s. 6d.

ENOGGERA SALEYARDS.

Animal.	JULY. Prices.
Bullocks	£9 5s. to £11 7s. 6d.
Cows	£8 2s. 6d. to £10.
Merino Wethers	25s.
C.B. "	25s. 6d.
Merino Ewes	16s.
C.B. "	22s. 3d.
Lambs	18s. 9d.
Pigs (Baconers)	...
" (Porkers)	...

Farm and Garden Notes for October.

Field.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, sorghum, setaria, imphee, prairie grass, panicum, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous Journals giving full instructions how to manage coffee plants, from preparing the ground to harvesting the crop, to which our readers are referred. The planting of the sisal agave and the Fourcroya may be proceeded with at any time of the year, but the best time is in spring and beginning of summer, when warm weather and good showers will enable the young plants to root quickly and become firmly established before the winter. The demand for the fibre is constantly increasing, and the supply does not nearly overtake the demand; hence prices keep high, and the outlook for the future is very promising. See our instructions in "The Sisal Industry in Queensland," obtainable free by intending planters on application to the Under Secretary, Department of Agriculture and Stock. Plant only on dry or well-drained soil. Cotton may still be sown.

Kitchen Garden.—Our notes for this month will not vary much from those for September. Sowings may be made of all kinds of vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 feet apart, with 18 inches between the plants. The kitchen garden should be deeply dug and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting; otherwise, the crops will be drawn and worthless. Thin out melon and cucumber plants. Give plenty of water, and mulch tomato plants planted out last month. Asparagus beds will require plentiful watering and a good top-dressing of short manure. Rosella seeds may be sown this month. No farm should be without rosellas; they are easily grown, they bear heavily, they make an excellent preserve, and are infinitely preferable to the mulberry for puddings. The bark supplies a splendid tough fibre for tying up plants. The fruit also makes a delicious wine.

Flower Garden.—The flower garden will now be showing the result of the care bestowed upon it during the past two months. The principal work to be done this month is the raking and stirring of the beds, staking, shading, and watering. Annuals may be sown as directed for last month. Plant chrysanthemums, gladiolus, and other bulbs, such as tuberose, crinum, ismene, amaryllis, pancratium, hermocallis, hippeastrum, dahlias, &c., &c. Water seedlings well after planting, and shade for a few days. Roses should now be in full bloom. Keep free from aphis, and cut off all spent flowers. Get the lawn-mower out and keep the grass down. Hoe the borders well, and trim the grass edges.

Orchard Notes for October.

BY ALBERT H. BENSON.

Keep the land well cultivated, and, if dry, see that it is well stirred, but not turned. Attend to the disbudding of all young trees, for, if superfluous growths are checked now, they are converted into fruit-wood, and the vigour of the tree is thrown into those shoots which are to form the future branches of the tree. Disbud all vines, rubbing out all superfluous shoots, leaving only as many canes as the vine is strong enough to mature fruit to perfection on.

Sulphur all vines to prevent oïdium, as, if there is any muggy weather during the month, this disease is sure to make its appearance. Where Black-spot is present, spray the vines with Bordeaux mixture; and if caterpillars are troublesome as well, then add 1 oz. of Paris green to each 2 gallons of Bordeaux mixture, and both pests will be destroyed by the one spraying. When using Bordeaux mixture, there is no necessity to use sulphur for oïdium, as the Bordeaux mixture answers equally as well. Don't spray when the vines are in blossom; but with varieties that are shy setters it is often a good plan to sulphur when in blossom.

The nursery should be carefully attended to; where not already done, the ties of all grafts should be cut and the scions should be trained so as to make a single upright stem. Where buds have been put in, they should be started by cutting back the stock sufficiently to cause them to grow, but the stock should not be cut hard back all at once, but by degrees, always leaving a portion of the stock above the bud to tie the young shoot to. Plant pines and bananas during the month, selecting suckers from healthy plants and from plants that are good croppers, and that produce good fruit, as a careful selection of suckers always pays well. Continue the treatment for Maori or Rust Mite of the orange recommended in the Notes for September; and where orange bugs, either the green or bronze, are present, destroy every mature insect that can be found, so as to prevent them breeding, as the killing off of the first crop will materially lessen their number for the season. Hand-picking, though slow, is probably the best remedy, though, before the insects are fully grown, large numbers may be destroyed by driving them on to the main branches of the trees and sweeping them off with a broom on to a cloth, from which they can be gathered and killed. Take every possible precaution against the fruit fly by destroying every infested fruit that you can. If there are maggots in cumquats or any other fruits, destroy every one, as the cleaner the sweep that is made of the first crop of flies the less trouble there will be throughout the season. Where Scale Insects have been introduced on young trees into clean districts, every care should be taken to keep the pest from spreading; and in cases where the young trees are badly affected it will pay the grower to destroy them at once, as the first loss will be the least. Where leaf-eating insects of any kind are troublesome—such as caterpillars of all kinds, the larvæ of the fig beetles, or the false ladybirds that attack all kinds of cucurbitous plants, potatoes, &c.—they can be readily destroyed by a spraying of Paris green, 1 oz. to 10 gallons of water, with lime added in as large quantity as can be got through the nozzle of the pump without choking, as this will tend to make the poison stick on better to the leaves, branches, or fruit.

Agriculture.

THE QUEENSLAND WHEAT CROP OF 1906.

We have been favoured with an early copy of the annual report of the Government Statistician, and from it we extract the following interesting facts and figures relating to the wheat crop of 1906:—

"The student of history realises that the lasting and substantial prosperity of a country is generally in direct proportion to the extent to which its population is engaged in agricultural production. Mines and forests may prove of great value in a country but recently occupied by a civilised race, by attracting population and inducing pioneer work, so essential to the opening up of unknown territory. These have done, and are doing, good work for Queensland, but it is the farmer that will prove the source of the most permanent prosperity. The enormous areas of rich soil, and great range of climate, proclaim Queensland an essentially agricultural country, and its proved capacity for the production of wheat points to the State ultimately taking a prominent position as an exporter of this staple breadstuff.

"Unfortunately, the results of the wheat crop for 1906 were hardly satisfactory, the area and the production being both below those for 1905, and although the average yield was greater in the former than in the latter year, yet the increase in this respect was fractional only. Rust, mainly due to heavy rain at an unseasonable period of the year, was the chief disturbing factor. Perhaps the importation a few years ago of large quantities of seed wheat, rendered necessary by the drought then obtaining, may have resulted in the introduction of varieties less resistant to rust than the acclimatised seed in use in previous years.

"Following is a return for the ten years ended 1906:—

—	Area.	Produce.	Average per Acre.
	Acres.	Bushels.	Bushels.
1897	57,788	1,009,293	17·47
1898	46,219	607,012	13·13
1899	52,527	614,414	11·70
1900	79,304	1,194,088	15·06
1901	87,232	1,692,222	19·40
1902	1,880	6,165	3·28
1903	138,096	2,436,799	17·65
1904	150,958	2,149,663	14·24
1905	119,356	1,137,321	9·53
1906	114,575	1,108,902	9·68
Average of 10 years	84,794	1,195,588	14·10

"There were 114,575 acres under wheat for grain in 1906, which was below that for either of the three immediately preceding years, slightly below that of 1905, and much below the other two years, the areas for these being—1904, 150,958 acres; 1903, 138,096 acres; and in 1905, 119,356 acres. Of the area reaped in 1906, 51,195 acres were unaffected by rust, and 63,380 more or less damaged by the pest. This is the most unsatisfactory position on this point experienced for many years, 55 per cent. of the total area being affected. During the past ten years the next largest proportion of the total area rusted were:—1897, 41 per cent.; 1903, 26 per cent.; and 1901, 12 per cent.

"As a result of the rust and rain the reduced production, as compared with 1903 and 1904, was greater than the falling off in the acreage, the returns for the last four years being:—1903, 2,436,799 bushels; 1904, 2,149,663 bushels;

1905, 1,137,321 bushels; and last year, 1,108,902 bushels. It will thus be seen that the output of wheat grain in 1905 and 1906 was only about one-half of what it was in the two preceding years.

"The yield per acre for the last ten years average 14·10 bushels. The means for ten years of the average yields for other States of the Commonwealth were:—New South Wales, 9·72; Victoria, 7·91; and South Australia, 5·37; so that the (for Queensland) low averages of 1905 and 1906 of 9·53 and 9·68 bushels per acre compare not unfavourably with the decennial averages of the three States quoted.

"During the past decade a successful crop in one State was by no means accompanied by like good fortune in each of the others. In 1897 the satisfactory return of 7·5 bushels in Queensland was accompanied by an average crop only in New South Wales, by but little more than half an average crop in Victoria, and by next door to a failure in South Australia. The year 1901 proved the record of the decade for Queensland, but not so with regard to either of the other States.

"With no expansion as to the area placed under wheat, any extension of the wheat cultivation line was not to be looked for, but all localities where this cereal was cultivated in previous years were represented in 1906.

"The bulk—78,279 acres, or 68 per cent.—of the total area under wheat was contributed by the Downs group of districts, followed by 34,424 acres, or 30 per cent., by the Maranoa. There was a relatively large increase on the very limited acreage planted in the West Moreton area, whilst the results obtained there were much more satisfactory than elsewhere, the 749 acres harvested returning 11,910 bushels, or an average of 15·90 bushels. From 78,279 acres on the Downs 939,369 bushels were garnered, an average of 12·00 bushels per acre; whilst from the 34,424 acres in Roma and surrounding districts only 144,959 bushels were obtained, an average of 4·21 bushels to each acre, a result mainly instrumental in bringing the average for the whole State below the mean annual return. But this, nevertheless, was better than was secured in the same locality in 1905. It is unfortunate that the Western areas, which gave a poor return from dry weather in 1905, were adversely affected by the opposite cause in 1906. It is, however, believed that the firstnamed difficulty may be much modified, if not overcome, by the use of sub-surface pressing-ploughs, whilst the selection of seed for drought and rust resisting varieties has been found to be most efficacious in the past.

"With the reduced output of the two successive years—1905-6—it was inevitable that the demand for breadstuff would have to be met by import. During 1906 wheat and its products were imported to the value of £340,044; as the value of the exports was £3,960, the total value of net imports of breadstuffs was £336,084.

"In both 1904 and 1905 the export of wheat was in excess of the import, the excess amounting to 238,585 centals, worth £64,910; not, however, because the local production had exceeded the local demand, as during the two years flour to the value of £385,862 was introduced into the State. Last year 261,398 centals of wheat, valued at £69,902, were in excess of exports, besides flour and biscuits to the value of £239,652 and £26,530 respectively.

"The consumption of wheat in this State averages slightly over 3,000,000 bushels each year, or a per capita demand of 6·10 bushels. The annual requirement has never yet been met by the local production, although there was a fairly close approximate in 1903, when 2,436,799 bushels were harvested.

"This average consumption of 6·10 bushels is based on a ten years' experience. For the first five years of the decade the demand was 6·25 bushels per head, and for the last five 5·96. It would be unwise to argue from this, however, that less was consumed during the later period.

"There were the same number of mills in operation in the State last year as in 1905, for although one was closed down in the metropolitan district, one was also reopened elsewhere, after having been closed for over two years. There

were 1,179,046 bushels of wheat treated during 1906. As the total net quantity imported was 435,663 bushels, equal to 22 per cent. on the quantity treated, 63 per cent. of the grain ground must have been of local production.

"The flour-milling industry availed itself at one time of the Vote for Loans in aid of Co-operative Agricultural Production, and at the end of 1905 a small balance was still owing by two mills to this account, but this was discharged during 1906, and the connection of this industry with the fund was thus closed."

GREEN-MANURING.

From the following remarks on the subject of green-manuring in the "Journal of Agriculture" (London) for July, 1907, it would appear that authorities are not unanimous on the value of the practice. Ploughing under green crops is practised to a considerable extent in Queensland, and where a long spell of dry weather has not followed on the operation very good results have been obtained. The "Journal" says:—

Green-manuring, or the ploughing under of green crops, is one of the oldest methods used to maintain or to increase the productivity of the soil. The effect varies with the character of the soil; sandy or gravelly soils are made darker in colour, and become more retentive of moisture, while clayey soils are made more porous and friable. The most important object achieved by green-manuring is the addition of humus to the soil, and, other things being equal, the best green manure crop is that which furnishes the largest amount of material which will readily decay in the soil and thus form humus. There are, however, additional ways in which such a crop may be beneficial. Deep-rooted plants are decidedly preferable to shallow-rooted ones, because they penetrate into the subsoil and thus admit air and water. Leguminous plants are also more valuable for green-manuring, because they not only provide humus, but also collect nitrogen from the air, which is thus added to the soil.

Green-manuring as a definite farm practice can only be recommended under certain conditions. It is very advantageous in improving the physical condition of sandy soils, and for this reason it has become a very common practice in Germany, where large areas of light soil exist. It was, in fact, the success obtained by M. Schultz, at Leopitz, in Saxony, in green-manuring light sandy soil with lupins that first directed attention to the value of leguminous crops as a means of adding nitrogen to the soil.

There is not so much evidence of its value on medium and heavy clay soils, though several German agriculturists appear to have practised it with success for many years. Generally speaking, it cannot be recommended on good soils, unless there is reason to believe that more humus is required, but where clover or some similar crop is used in rotation it is seldom necessary.

With regard to the crops employed for the purpose, leguminous plants are unhesitatingly recommended by practically all authorities both in Germany and the United States. In this country (England), rape, mustard, &c., are still employed, and in experiments carried out for a number of years at Woburn by the Royal Agricultural Society, these crops have given better results than tares when followed by wheat and barley. Tares are a leguminous crop, and, according to analysis, added more than twice as much nitrogen to the soil as did the mustard or rape. Nevertheless, the highest produce was in 1906, as in several previous years, obtained from green-manuring with mustard and rape, which yielded on the average 10 bushels more wheat than did the tares, in spite of the extra manuring which the latter crop supplied. In the report on the experiments, it is observed that "this result affords a thorough confirmation of the results obtained in former years, and leaves for solution a very interesting question—viz.: What is the cause of the apparent disappearance or, at least,

the non-working of the nitrogen, whereby a result is obtained in practice which is so different from that which theoretical considerations would lead one to expect?" Apparently somewhat similar results have been obtained with these grains in the United States, as in speaking of suitable crops to follow green leguminous manuring, it is observed in "Farmers' Bulletin No. 278," that "wheat and barley give varying results, often very favourable, but not infrequently there is no increase or even a loss." In Germany, too, this form of manuring is regarded as most advantageous to hoed crops, particularly roots, and also for oats, but as less suitable for wheat and barley.

Among the crops used for this purpose are various kinds of beans, peas, vetches, lupins, and clovers. Serradella is a very favourite crop in Germany for this purpose.

An objection to the practice of green-manuring lies in the fact that to a greater or less extent the crop occupies the land for a time without bringing in any return, and there can be little doubt that, except in special cases, it is better, where possible, to give the green crop to stock and distribute the manure over the land.

PREPARATION OF WOOL FOR MARKET.

The gradual increase in the number of young farmers who are going in for raising sheep and lambs calls for some instruction as to the best methods of preparing wool for the market. The following suggestions issued by the Home Woolbuyers' Association to woolgrowers on the preparation of wools for the market should be noted by them:—

Washing.—Sheep to be carefully washed, and clipped within ten or twelve days after washing, otherwise the wool cannot be fairly be sold as washed. Sheep should be properly dagged before washing, as the manure not only discolours the water but damages the fleece.

Clipped when Dry.—Sheep to be thoroughly dry before being clipped, as wool clipped in a damp state quickly deteriorates in appearance and value.

Clipping Yard.—The yard or shed where clipping takes place to be kept as clean as possible. Every care should be used to keep the wool free from grass, straw, or vegetable matter.

Winding Wool.—The fleece to be neatly wound (no string or twine should be used). All daggings to be taken off. Locks and broken wool to be packed separately.

Dip.—No dip which discolours the wool should be used.

Branding.—The sheep to be branded in such a manner that little of the marking remains when fleece is clipped. All parts affected by tar and composition have to be clipped off before the wool can be used, these being of little value. The association recommends all sheep to be marked with a mixture that is soluble in hot water, and whenever possible on the head.

Storing.—It is very important that wool should be stored in a dry place, and kept as clean as possible. No grain should be near the wool, as it is often carried into the pile by vermin.

Weighing.—No reliance can be placed on the weights of wool weighed in bulk at the railway stations.

The association recommends that wool should be weighed in some more reliable manner. The railway companies only weigh for traffic purposes, and do not guarantee correct weight between buyer and seller.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 31ST AUGUST, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Laura ...	Ayrshire ...	20 May, 1907	637	3·8	27·11	
Night ...	Holstein-Devon	28 May ,,	611	3·8	26·00	
Pee-wee ...	Holstein-Sh'rth'rn	6 April ,,	602	3·8	25·62	
Sue ...	Ayrshire-Sh'th'rn	22 April ,,	541	4·2	25·42	
Chocolate ...	Shorthorn ...	5 Mar. ,,	569	3·8	24·20	
Rhoda ...	Grade-Shorthorn	12 Mar. ,,	520	3·8	22·13	
Lass ...	Ayrshire ...	19 April ,,	488	4·0	21·86	
Dripping ...	Holstein-Sh'rth'rn	28 Nov., 1906	470	4·1	21·57	
Blank ...	Jersey-Ayrshire	4 Feb., 1907	415	4·4	20·45	
Nettle ...	Shorthorn ...	17 May ,,	518	3·8	22·04	
Hettie ...	Ayrshire-Sh'th'rn	27 April ,,	489	3·8	20·81	
Kit ...	Shorthorn ...	6 May ,,	502	3·5	19·67	
Poppie ...	Guernsey-Jersey	24 Feb. ,,	396	4·4	19·52	
Donah ...	Holstein ...	30 May ,,	479	3·6	19·30	
Renown ...	Ayrshire ...	27 Mar. ,,	432	3·9	18·87	
Wonder ...	Shorthorn ...	7 Dec., 1906	419	4·0	18·77	
Maggie ...	Holstein	12 May, 1907	466	3·5	18·26	First calf
Lowla ...	Ayrshire ...	25 Mar. ,,	416	3·8	17·70	
Linda ...	,, ...	12 Nov., 1906	376	4·2	17·67	
Bee ...	Jersey	27 Dec. ,,	270	5·8	17·54	
Dewdrop ...	Holstein	21 Mar., 1907	422	3·6	17·00	First calf

NOTE.—Cows given a daily ration of 35 lb. ensilage and 15 lb. chaff moistened with warm molasses and water. Owing to the dry weather, there is very little grazing.

INSANITARY MILKING-SHEDS.

If any justification were required of the stringent regulations under the Dairy Acts for the enforcing of cleanliness in milking-sheds, it is furnished by an experiment lately made by the State Veterinarian of Pennsylvania, U.S.A. He placed four healthy and two tuberculous cows in a sanitary dairy building, and four healthy and two tuberculous cows in an unsanitary building. The healthy cows were kept for seventeen months in the place originally assigned to them—except when they were out for exercise—and during this same time the two tuberculous cows of one stable were frequently exchanged with the two tuberculous cows of the other stable. It was arranged that each healthy cow should stand beside an unhealthy one, and, by changing the latter, each healthy cow was exposed to the same amount of danger throughout the period of experiment. At the end of seventeen months all twelve cattle were killed. It was found that two of the healthy cows of the sanitary stable had developed slight cases of tuberculosis, and all four cows in the unsanitary stable had developed severe cases of tuberculosis. This experiment showed that unsanitary dairy buildings have much to do in aiding the spread of diseases. Leaving aside all considerations save profit, it is in the interest of the dairyman to keep his cows in perfect health.

THE GUERNSEY COW.

Not much is heard about the Guernsey cow in Queensland, but the time may come when this breed will be as much appreciated in this State as it is in America. At the Queensland Agricultural College, Poppie, a Guernsey-Jersey cow, gave 542 lb. of milk of 4·2 per cent. butter fat, yielding 26·63 lb. of commercial butter; Primrose, a Guernsey-Ayrshire, gave 522 lb. of milk, of 3·6 per cent. butter fat, yielding 21·98 lb. of butter, with her first calf, both for the month of July. Let us see what the Guernsey does in America, where she is winning her way into the dairyman's favour, and where her popularity is assured:—

One of the best indications of the growth of the Guernsey interests is the increase of the "Herd Register." Last year showed more entries, and a larger number of transfers, than any preceding year, and at the present time there are 11,185 bulls and 20,859 cows in the "Register," or a total of 32,044 animals. In a recent number of "Hoard's Dairyman" a classification of records is given, which affords interesting evidence of the capabilities of the Guernsey:—Best year's milk record, 14,920·8 lb.; best year's butter fat record, 857·15 lb., or equivalent to 1,000 lb. of butter. An average of the different classes for cows in the "Advanced Register" showed a production for each of the 400 cows tested, whose ages ranged from five years, and one down to two years, of 7,997·68 lb. of milk, testing 5·06 per cent., and containing 405·29 lb. butter fat, equivalent to 473 lb. butter.

According to this, the Guernsey is a cow worthy of attention by Queensland dairymen, provided the climate suits her, although, as it suits the more delicate Jersey, the former should not be behind the latter in stamina.

HORSE-BREEDING IN QUEENSLAND.

The "Live Stock Journal" says:—Queensland has been for many decades the colony from which remount buyers have drawn their supplies. Queensland horses have been shipped in great numbers to India by the British-India steamers, and the Queensland "waler" is a commonplace in the Indian army and polo ground. A lot of money is being made in this trade, which, however, is fairly speculative, success depending upon intimate knowledge of the Queensland horse markets for buying and the Indian markets for selling. The South African war made a great draft upon suitable horses in the colony. With a succession of favourable seasons in Queensland of late years, the horse marts are becoming well supplied, and opportunities are present for wholesale buying for export. There are large horse saleyards in the principal centres of the colony: Toowoomba, on the Darling Downs, a few hours from Brisbane, is the chief centre of the trade in Queensland. Horses yarded of late show evidences of better condition and more careful breeding than in former years. Breeders are securing the best and most useful strains. In the past too much has been done in the production of a lanky racer and a showy curvetter, but now the Queensland horse-breeder is fixing the more serviceable breeds that find acceptance with foreign buyers. An Indian official purchasing station is to be opened in Queensland, and the United States are about to start buying for their Manila military forces. The Dutch Government is buying horses for Java in Queensland, and the Chinese are inquiring about the feasibility of procuring horses there for their cavalry and artillery enterprises.

The Horse.

WHAT WEIGHT SHOULD A HORSE CARRY?

We are often inclined to pity a small pony carrying a heavy man on his back, apparently quite disproportioned to the powers of the animal. But it is not always the biggest horse that has the most carrying and staying power. During the Egyptian war, Colonel Drury Lowe, in his march to seize Cairo, was obliged to discard the big British troop horses and mount his big men on the small Arab ponies, which proved quite equal to the work. Amongst human beings a great, tall, gaunt man will often succumb under a load which a little nuggety-built man will make light of. So it is with horses. A thick-set pony, with a bit of breeding, will carry weight and wear down a brute twice his weight that lacks quality; and a high-bred weed will, even when poor, often work to death a horse of substance. Nevertheless, other things being equal, size, of course, indicates strength, and having this in view an English army veterinary, Major Smith, some time ago made exhaustive inquiries into the question, "What weight should a horse be asked to carry?" The method adopted (says the "British Live Stock Journal") was to ask an independent observer to estimate the horse's carrying capacity, test that in practice, and then weigh the horse; in this way the proportion which the estimated weight-carrying capacity bore to the body weight was ascertained. Veterinary Major Smith's system was applied to two groups of horses belonging to light and heavy cavalry, and the result was as we might expect, broadly speaking, the heavier the horse the more it could carry. The bridge on which the horses were weighed was not sensitive within 28 lb. It was found that 13 horses whose carrying capacity had been estimated at an average of 170 lb. weighed each 952 lb.; that 10 whose carrying capacity had been put at an average of 175 lb. weighed each 980 lb.; that 10 whose carrying power had been put at 178 lb. (average) weighed each 1,036 lb. Further calculations and allowances were made to determine the relationship of a body-weight to carrying-power, in a military sense—*i.e.*, performing hard and continuous work—and it was found that, roughly speaking, 5¾ lb. of body-weight were required to carry 1 lb. on the back during severe exertion.

POLO PONY BREEDING IN ARGENTINA.

No matter how up-to-date in stockbreeding we may be here in Australia, it can do us no harm to look over the fence and see what they are doing in the same line in other countries. In this State we cannot boast of doing wonders in the way of horse-breeding, yet Queensland is splendidly adapted for the business, and so great is the demand for really good stock that it is pretty certain that prices will have an upward rather than a downward tendency. We want, first of all, to get rid of all the useless, weedy stallions which are to be seen in many districts, after which we might make a name for Queensland horses second to none in the world.

Mr. Frank J. Balfour writes an excellent article in the "Live Stock Journal," which shows how severe a competitor the Argentine cannot fail to be in the matter of horse-breeding. He says:—

In the last few numbers of your journal to hand you print so many words of encouragement to polo pony breeders that I have thought you might care to

know something about breeding ponies in this country, its cost compared with breeding them in England, and the market that may very soon be established here for pedigree ponies.

There can be little doubt that when our "estancieros" take seriously to breeding polo ponies for polo, they will be able to put the raw material on the market very much more cheaply than can breeders at home, but just as owners of high-class flocks and herds supply us with rams and bulls to improve our breeds of sheep and cattle, leaving us to provide cheap beef and mutton, so will English breeders of pedigree polo ponies find us good customers for the stallions and mares required to bring the existing stock in the country up to the required standard for the home demand.

Argentine polo ponies have had their ups and downs in polo players' estimations, but I am sure that all will agree that the well-bred ones are as good as any that can be obtained outside the British Isles, whilst the commoner sorts, on account of their being so cheap and easy to play, make excellent beginners' ponies for regiments and country clubs.

Hundreds of thoroughbreds have been imported into Argentina during the last thirty years from England and France, and, though at first the stallions included many very bad horses, of late breeders have learnt by experience that only the best are worth having, and there are to-day some of the finest thoroughbreds in the world in the various studs scattered over the Republic. These are bound to affect the general horse stock sooner or later, and, after all, good thoroughbred blood makes the best foundation for a breed of ponies required for modern polo.

This estancia is like hundreds of others in Argentina where lucerne is grown as a forage plant, and where cattle, sheep, and horses are bred, and our general system and our expenses will more or less correspond with those of other similar places. Half of the estancia consists of the coarse grass natural to this part of the country, and the other half is laid down in lucerne and divided into a number of paddocks, averaging 400 acres apiece. All the paddocks are watered from semi-artesian wells pumped by windmills, and I may mention that most of us out here are much more particular as to the watering arrangements for our stock than are the majority of farmers at home. Although the cattle and sheep are looked to principally for bringing in the dollars, horses have risen so greatly in value since the South African war that a few good mares give a capital return. I have at present three "manadas." One manada consists of Shire mares, which are served by the imported Blaisdon Major by Blaisdon Conqueror out of Blaisdon Gip, a winner at Cardiff, and bought for me at the late Mr. Stubs's sale. Another manada is made up of mares of medium weight, and these are served by a stallion that gets a useful colt of the vanner type from them. The remaining mares are the polo ponies, 40 in number, and run with the imported Shy Boy by Rosewater out of Shy Lass, by Albert Victor, a pony bred by Sir Humphrey de Trafford, and a winner of fourteen prizes in England, including two for bending. This is Shy Boy's first season here, as I only brought him out last November. Hitherto I had used a small thoroughbred stallion, bred in the country, on the polo pony brood mares. These latter have all done something or other to warrant their inclusion in the stud. Some have been good performers on the polo ground, others have won races, whilst some have only been sufficiently broken to make sure their pace, temper, and courage were good. All the mares for six months of the year run together, from the beginning of April to the end of September, in the rough grass paddocks before referred to, with most of the breeding cows. A man is in charge of these paddocks, and he probably sees every animal in them once a day, reporting anything wrong to headquarters. Beyond this daily revision the mares require no other attention. The stallions during these same months run together, if they agree, in a small lucerne paddock near the estancia, and if the winter is good they require no supplementary ration, but if grass is scarce

they get one, or perhaps two, feeds of maize taken out to them each day. This winter is a good one, though we are having hard frosts every night. The stallions are getting no extra feed, and are rolling fat.

At the beginning of October the mares are brought into the lucerne paddocks, divided up into their different manadas, and put into separate paddocks with their respective stallions. Were the brood mares and cows kept for breeding grazed all the year round on lucerne, they would become so fat they would not breed. Most of the foals are weaned in April, and those too young to take away from their mothers then are left with them, and weaned from time to time during the winter. Once weaned, the young ones are generally left in the lucerne paddocks till they are sold as three-year-olds, the age at which they undoubtedly give the best return. It is a good plan to break the yearlings to handle, as it lessens the risk of injury when they are caught up later to be broken or sold. Calculating on a 10 per cent. return at present values, to keep the mares as I have described costs about 20s. a year, the colts and fillies on lucerne will cost about 30s., and the stallions about £10. To break the young ones to handle costs very little if the work is done as opportunity occurs by one of the regular staff, and if a professional breaker is employed specially to do it the expense is never more than 10s. a head. Money here is dear, and interest, which runs from 7 to 10 per cent., is a big item to reckon with, whilst depreciation would have to be put down between 15 and 20 per cent. Brood mares like the ponies I have now would be valued at about £10 each, and the stallion at £100.

You will see, therefore, that it is possible for us to breed a first-class pony at a cost of about £10 when three years old, reckoning on the mares giving 75 per cent. of foals. Only two of my pony mares missed last season, and these are a very aged pair. Freight to England, including fodder, insurance, attendance, and fittings, costs £10. The disposal of the misfits is not a serious question for us. The most useful saddle horse for general purposes is one measuring from 14 hands to 15 hands. Too big a horse is not handy enough for cattle work; he goes all to pieces if keep is not good, is a trouble to get on and off when riding about the estancia, and is tiring to ride for a long day's work. Well-bred horses between 14 hands 2 inches and 15 hands also sell well to the Government for remounts or to the police.

Breaking ponies for polo is not such a difficult nor such a long business with us as it is in the old country. A pony will learn to stop, turn, and gallop after a cow or other animal in half the time he will when he has nothing to follow, so that if ridden on an estancia in the ordinary work of the day he soon becomes handy, and learns, besides, to ride off well.

As there are no stones we never have to shoe our horses, and so save one more expense.

So far as I know, only two ponies in the Polo and Riding Pony Society's Studbook have been imported into Argentina for stud purposes—Mr. Marsden Withington's Maréchal Niel, imported by him last year for a very successful stud he has in the south, and my own stallion, Shy Boy. Already, however, the attention of estancieros has been called to the breeding of polo ponies, and I, for one, have been asked by several friends to get them a stallion when next in England. There are now two classes for polo ponies at the great annual show in Buenos Ayres, so although I have explained how it is we can produce the raw article cheaper here than can be done at home, I am sure that the good time you prophesy for English breeders of pedigree polo ponies is likely to be a better one still when Argentine buyers and exporters of pedigree stock include in their annual purchases stallions and mares registered by the Polo and Riding Pony Society in their excellent studbook.

No pony likely to be sold for export to this country should be docked. A long tail is a wonderful protection against the cold winds in winter, whilst in summer it helps to keep away the flies and mosquitoes, which in some districts give horses at grass a very troublesome time.

Poultry.

OSTRICH FARMING.*

All accounts of this industry in countries where, as in South Africa and Egypt, the business is carried on with much profit, agree in admitting that, under suitable conditions, the profits are very considerable. In Queensland there is a very large range of country admirably adapted for rearing the birds. Some two years ago, a gentleman who had made a study of ostrich farming, suggested the formation of a company for the utilisation of Stradbroke Island in this manner. He said that the island was singularly suitable for the raising of ostriches. The labour connected with the business is very light, consisting mainly of watching and feeding the birds, and hence he suggested that the inmates of Dunwich, who are physically fit for light work, could be employed in this manner, earning a fair wage for themselves and also relieving the State of considerable expenditure, since the birds would bring in a very handsome return for the outlay, provided always that expert scientific management were kept in view. He reckoned the outlay of the State would be:—

10 pairs of ostriches, at £150 per pair	£1,500
Carriage from South Africa, at £20 per pair ...	200
Fencing 16 miles, at £40 per mile	640
	£2,340

Besides this, incubators would have to be bought, the cost of which for ostrich eggs he could not correctly estimate, but set it down at £300 at the outside, which would bring the expenditure up to £2,640, or, with unforeseen incidentals, to £3,000. Much valuable information on the business could be obtained from the manager of the Hetonan Ostrich Farm, Egypt, which is conducted on the latest and most scientific principles, and realises enormous profits.

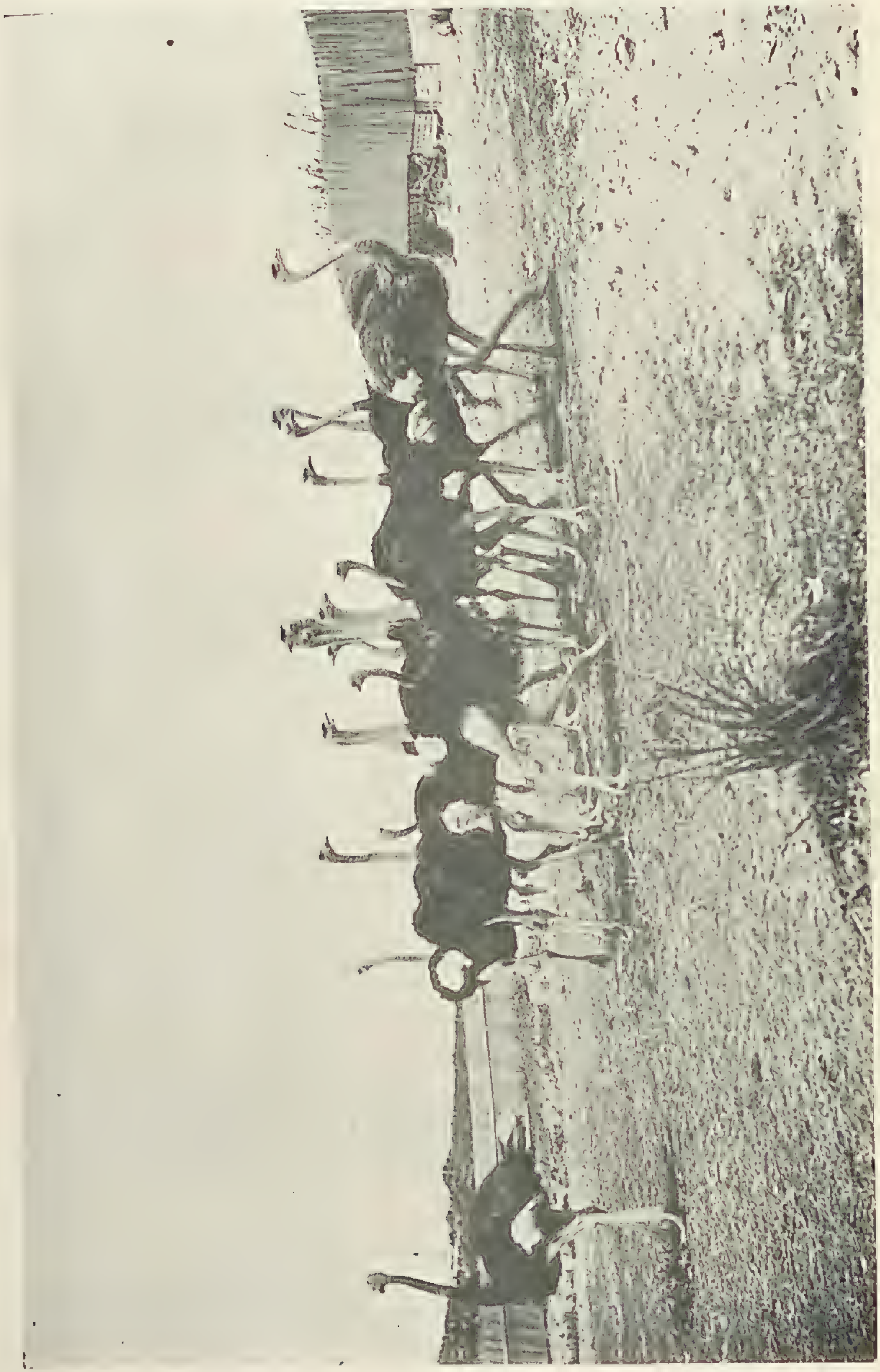
The paddocks there are laid out in circular form, each paddock holding one pair of ostriches during the breeding season. At the centre is a raised platform, where a man supervises the whole work.

At the late exhibition of the Queensland National Association there was an exhibit of ostrich feathers in the Central District exhibit, which came from Jericho, 206 miles west of Rockhampton. Ostriches are also bred at the Hawkesbury College, New South Wales, and, we believe, also in South Australia.

The Principal of the Hawkesbury College stated, in reply to inquiries from this department, that it is about six years since the birds were introduced there. The results have, so far, been satisfactory, though some trouble was at first experienced in getting the birds to mate. They are easily managed, and any class of poultry food suits them when grazing is not available. The latter is the cheapest, because the birds are better for the exercise in looking for the food. It has been found that much depends on environment to secure a high percentage of feathers, for which there is always a payable market for feathers of a high class. As much as from £3 to £4 has been obtained from the annual picking of three-year-old cock birds. The climate at Hawkesbury suits them admirably, the birds are rarely sick or ailing, and the losses with mature birds have been very slight. Such testimony is incontrovertible, and, if ostriches can be profitable in New South Wales, there would seem to be no reason why they should not be more so in this State, which has a climate in all probability more suited to their requirements.

* Our illustrations of ostriches are from photos. taken by Mr. H. W. Mobsby, Artist to the Department of Agriculture and Stock, at Mr. Barraclough's ostrich farm, South Head, Sydney.

Plate XVIII.



Portion of the Ostrich Flock at Barraclough's Ostrich Farm.

The "Agricultural Journal of Natal" contains the following interesting account of an ostrich farm run by Mr. W. J. Slatter, of Holm Lacy, near Greytown. The author writes under the *nom de plume* of "Ergates," as follows:—

The profits to be derived from ostrich farming, under suitable conditions, are tempting. Such being a fact, and it also being a fact that Natal has much land admirably adapted for rearing the birds, I determined to seek information on the subject. A good many inquiries which I made pointed to the desirability of seeing Mr. D. C. Slatter, of Greytown, on the subject. For reasons having no bearing on the profit of the enterprise, he gave up farming the birds after two and a-half years, and transferred his stock to his brother, Mr. W. J. Slatter, of Holm Lacy, near Greytown, who is also a firm believer in the profitable character of the industry.

Starting with Ostriches.

Mr. D. C. Slatter I found, and he consented to be "interviewed." His previous experience had been chiefly in connection with prospecting for gold, but in 1895 he determined to give a trial to the quiet of farm life. For stock he selected ostriches. In 1882 he had something to do with these birds. In partnership with his brothers and Mr. Chas. Raw, he bought some breeding birds from a Mr. Frisby, whose importation of Cape birds will be well and, in some instances, sorrowfully remembered by many colonists. In the following year there was a tremendous slump in ostriches, and they became practically valueless. The birds in which Mr. Slatter was interested were run in the neighbourhood of Maritzburg—an unsuitable locality. They were totally neglected, and died or disappeared. On the farm of his brother, Mr. W. J. Slatter, Holm Lacy, in the "Thorns" portion, he started his second venture in 1896, with a plot of 10 acres under water and as much run as he wanted. The birds—four pairs—were bought from Mr. G. S. Keel, and cost together £125. He made no attempt to select the birds, but placed himself in the hands of Mr. Keel, and had every reason to be satisfied with the result.

Preparatory.

The first work was the making for the four pairs of birds of four 5-acre paddocks—wire interlaced with bush, and the putting of crops into the 10 acres of irrigable land. He put in half an acre of lucerne—he says he would have done better to have put in 4 acres—quarter-acre cabbages and root crops, and the remainder was used for mealies and forage. He never had greenstuff to spare for the old birds. Lucerne he considers the sheet anchor in ostrich rearing. Despite this absence, his birds were always in prime condition, their feathers never showing bars—the result, like breaks in wool, of insufficient food. In every paddock there should be running water, wood ashes, and a box of crushed bones. In September, 1896, appeared the first hatch of chicks, and the last in September of the following year, giving in all 60 chicks, of which 53 were reared, the others having died from accidents, delicacy, &c.

Hatching.

As soon as one or two eggs are laid, a round hole, 2 yards wide and 18 inches deep, should be dug close to the eggs, and the hole filled in level with coarse sand or gravel. A few days later the eggs should be moved on to the nest. The object of waiting a few days before moving the eggs is to avoid the risk of the hen taking fright. As soon as the eggs have been laid the cock takes upon himself almost the whole of the family cares and anxieties resulting therefrom. He does the most of the sitting on the nest; an ostrich's nest is left untended during the hot part of the day. If, however, a change in the weather is threatening he shows signs of concern, and in the event of a sudden shower scuttles off and spreads himself over the nest, his mate placidly feeding

the while. The chicks having emerged from the shell, they are left with the parents for three or four days. Then the chicks are removed. This work is of sporting character, for the cock becomes furious. While the chicks are being taken away he is kept under control by a forked stick held against his neck. On the robbery being completed, he will sometimes throw himself on the ground, giving forth grunts or groans of despair and anger, his mate on the other hand showing absolute indifference. Some breeders take away the chicks immediately they are hatched, but Mr. Slatter holds that the initial care of the parents is better than can be given artificially, and that all the advantages of hand-rearing are just as obtainable as if the birds were taken away at the moment of hatching. Mr. Slatter tried both systems, and found that by following that which he advocates the chicks become altogether stronger and more robust.

EARLY LIFE.

For five or six days the chicks are kept in a small enclosure—say, 20 feet by 12. They must have plenty of clean water, river sand, bones broken very small, and wood ashes in which to clean themselves. Lucerne is the best food, and only food, required by the young chicks. It must be quite fresh; if stale and fermenting, it will certainly kill them. An umfaan is their constant attendant, and takes upon himself the duties of the mother, or, rather, the father. He teaches the chicks what to feed on by working his forearm up and down, the wrist bent, and the end of the pointed fingers just touching the food. Where he makes this movement the chicks gather round and pick up the food so indicated. If he leaves them, the fact soon becomes known by the noise they make.

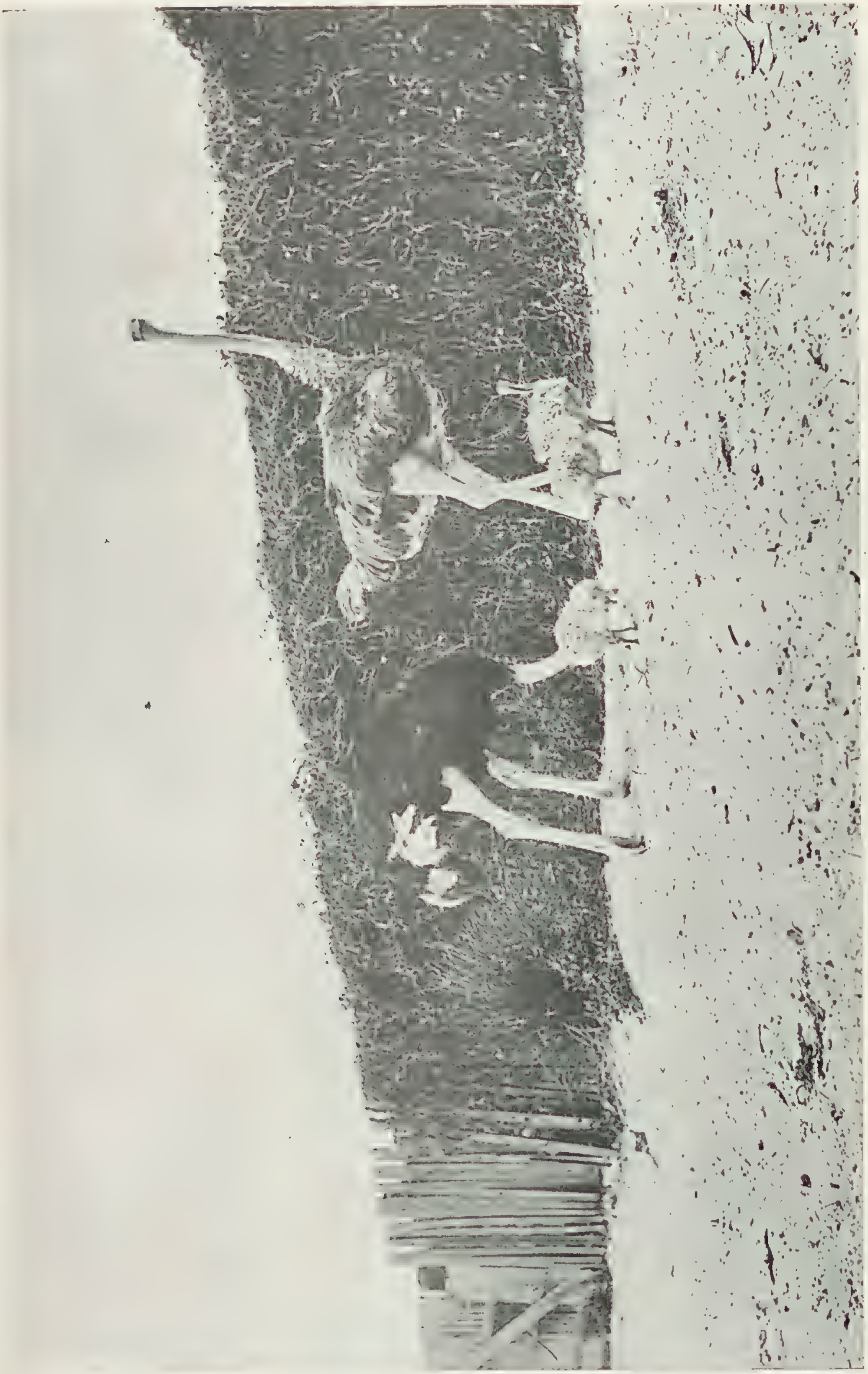
DREAD OF DOGS.

"I may here," said Mr. Slatter, "say something about dogs. Dogs and barbed wire fences are the curses of an ostrich farmer's life. Ostriches have naturally the greatest possible dread of a dog. A dog stampedes them, and such is their instinctive dread that they bolt off instantly in whichever direction their heads may be pointing at the time. They are blind with terror, and rush through fences, or are maimed by them, and flung helpless to the ground. The injuries they do themselves would appear to many incredible, and the quick recoveries they also make if the wounds do not affect the vital parts would also appear just as incredible. When I first stitched up a bird which had the neck ripped down and the breast laid open, exposing the gizzard, &c., I would not have given much for its chance of life. But it recovered quickly; it began feeding as soon as the stitching was finished, and from that moment it was never again off its feed. The curious look of ostriches when they see strange cattle or horses become alarmed at them is most amusing. Now I am coming to the point. My umfaans had dogs, and thus the chicks became introduced to the dreadful species from the very start of life. Chicks seem too young to be subject to the instinctive fear. There was, however, aversion. I have seen a chick hardly bigger than an ordinary hen walk aggressively up to a dog, and with its diminutive legs try to give the astonished dog the cutting-down stroke. This early intimacy with the dogs I consider desirable, for I have noticed that in their after life birds so brought up, although greatly excited by the presence of a dog, have not stampeded."

SECOND STAGE.

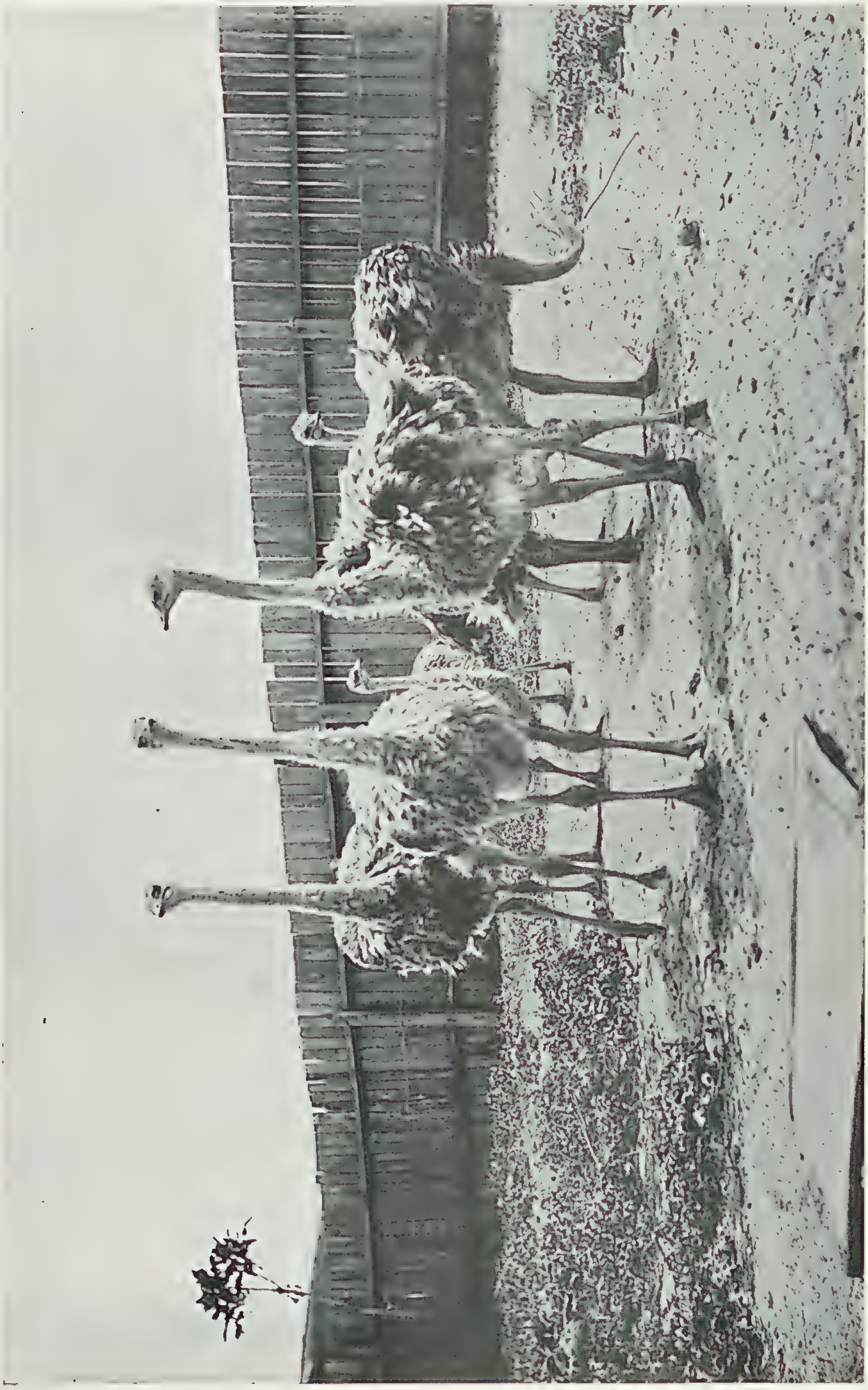
The hatch (as the brood is called) after the fifth or sixth day should be put into a wire-net enclosure of about 20 feet by 20, on lucerne. The umfaan still remains with the chicks to afford them parental company and protection. The picking motion with his arm soon teaches them to pluck the leaves themselves. Always shift the wire-net enclosure on fresh lucerne after a few days' feeding; the enclosures can be enlarged as the chicks get older.

Plate XX.



A FAMILY OF OSTRICHES, BARRACLOUGH'S OSTRICH FARM.

Plate XXI.



Group of Fifteen-months-old Ostriches, Barraclough's Ostrich Farm.

Wet and Cold Weather.

"Weather which is wet and cold is fatal to chicks—and it must not be forgotten that while the weather is extremely hot in the 'Thorns' as a rule during the daytime, it is somewhat cold at night, and with rain from the south the cold is intense in comparison with the usual temperature. If such weather as the last comes on, I put the birds into padded boxes, partially covered over with sacks, in a kafir hut, where a screened fire is burning. Chicks which have once suffered badly from cold and wet are always delicate in after life. This plan was most successful. If I had continued I should have built a brick house about 45 feet long by 12 feet broad, and thatch roof. One-third would be cut off by a partition wall, and in that room I would have put a fireplace for use when necessary."

Third Stage.

"When they are about a couple of months old they may be taken among the mealies. They devote all their attention to the weeds, and do no injury to the crop. Two months later they can be taken to graze on the veld, but until they are about six months old they should still be shedded every night. Arrived at that stage of life they require no more night shelter, and may be left at sundown in the home paddock. There are ostrich farmers who continue artificial feeding till the birds are six months old, but I do not in the least hold with that system. At eighteen months the birds are thoroughly strong. They begin breeding when four years old, and go on till they are twenty. While in the chick stage—until the end of six months—the birds must be turned out early and brought back to their shed before the sun goes down.

Plucking.

"Chicks should have their feathers clipped when six months old, the stumps being drawn out two months later. The first plucking will be worth about 18s. The next plucking, taken six months after the drawing of the stumps, will be worth about 30s., and subsequent pluckings will vary in value from £3 to £5. Chicks are worth £5 or £6, and breeding pairs fully £30."

The Profits.

"And what did you clear?"

"I cleared within two and a-half years £318 gross profit on my small investment of £125. I cannot think of anything else in farming that pays better. It must be borne in mind that the ostrich farmer does not rely on the local market—a market which is always going up and down. In the £318 profit I have made no allowance for the interest on the capital I put into the paddock, fences, and sheds—say, £30 altogether—nor for the more important item of labour for herding and cultivation, which, however, was very small, because the conditions vary much as to rates of wages, and because the cost of labour grows proportionately smaller as the flock grows bigger. My success drew attention, and half a dozen have followed in the neighbourhood. My brother bought my original breeding birds, and subsequently he bought others. Ostrich farming in the 'Thorn' country of Natal is a solid and most profitable industry; there is no mistake about that. And it is a comfortable, easy-going occupation—just the thing for a man not wishing to be extravagant in the expenditure of energy. But the man must know how to do what is wanted, and his supervision should be constant. Staying at home he may often think that he has hardly anything to do, but if he goes away much he will soon have reason to rue it. Hired white men can only rarely be relied on. On careful selection I think capitalists might do well in letting out birds on shares. A good book on the subject? Yes, Douglass's 'Ostrich Farming,' published by Cassells, is good, and I agree with most, but the writer dwells so much on the ailments to which birds may be subject that he is apt to frighten a beginner. Just keep to the 'Thorns' and the edge of the 'Thorns' country in this colony, and follow with common sense on the lines I have tried to sketch out, and success must be certain."

Singular to say, in the two accounts of ostrich farms which we publish, no mention is made of the time of duration of incubation. From a paper on "Ostrich Farming" read before the British Association on the occasion of the visit of that body to the Transvaal in October, 1905, by the Hon. Arthur Douglass, and recorded in the "Transvaal Agricultural Journal," we find that the eggs hatch out in six weeks.

AN EGYPTIAN OSTRICH FARM.

The Rev. E. J. Hardy, M.A., describes the ostrich farm at Matariya, near Cairo, Egypt, as follows:—

The ostrich farm of which we are now speaking is situated on the desert about 8 miles from Cairo. It consists of the house of the manager and the collection of pens or paddocks in which the ostriches live to produce feathers for ladies. The enclosures, in which are at the present time 1,100 birds, are not roofed, because the warm and practically rainless climate of Egypt renders this unnecessary. They are of two sizes. One is a sort of common room, in which young and unmarried male and female ostriches to the number of from 10 to 20 live together. The other kind of enclosure is much smaller, and is reserved for one male and one female bird when, at five years of age, they show signs of desiring to set up house for themselves. In the sand floor of this house the cock scrapes a shallow hole, and invites the hen to lay in it her eggs, which she does until they number about a dozen. Men husbands might learn a lesson from the fact that the ostrich shares all domestic duties with his wife except that of laying eggs. Both birds sit in turn on the eggs, relieving each other every three hours as punctually as if they wore the best watches. It was amusing to see the husband walking up and down waiting anxiously, or at least conscientiously, for the time to come for him to take his seat on what in Egypt must be almost as warm as a domestic hearth.

In South Africa incubators are used, but not at the Egyptian ostrich farm. Here it is found that the eggs are more productive when hatched by the birds themselves. "Them big fowl" (as an Irish attendant calls the ostriches) instinctively know whether or not an egg is fertile. If it is not they turn it out of their nest, and no matter how often a man may replace it he finds that it is put outside the nest again. (At the Sydney farm the male ostrich assists at the actual hatching of the chicks, watching carefully for the moment when the young bird has chipped the egg, and has freed its head from the shell. He then seizes the chick by the head and flings it up into the air to a considerable height. The fall breaks the shell, and completes the operation of setting the chick free.)

Those who, like myself, often visit the ostrich farm near Cairo seem to find the number of baby ostriches the same, and that they are at similar stages of development each visit. Of course they are different birds, but only their caretakers notice the difference in them. Baby ostriches are fluffy little brown things covered with down and small feathers.

When the ostrich is six months old it has to give a harvest of feathers, which are black and white in the case of the male bird and grey in that of the female. Eight months after this, and each successive eight months, another crop is ready to adorn the hat of a lady of Belgravia or of a "lidy" of Whitechapel. There is no warrant in nature for girls and women wearing feathers at all, but it is particularly unnatural when hats are adorned with ostrich feathers of a green, red, or other colour not worn by the bird.

In South Africa the feathers are cut off the birds; at the Egyptian farm they are plucked. I was told that the latter operation did not hurt, but any of my readers who have been plucked in an examination will doubt the statement. Plucking cannot give an ostrich much pleasure when it requires six men with ropes to hold him while it is being done. The small feathers that fall off themselves are collected, sewn together, and made into boas.

A lady once remarked to me that an ostrich looks foolish from top to bottom, but in reality the bird is no fool. It is generally believed that when pursued he hides his head in the sand and imagines that the danger has ceased because it is no longer seen. Those who, like my friends at the ostrich farm, have to catch him occasionally for plucking or other purposes, know that he is by no means the foolish, cowardly bird the maker of metaphors would have us believe. The ostrich can give a terrible kick. One of the men at the farm was nearly killed by one lately.

What is the food that nourishes the ostrich and its lovely feathers at the Cairo farm? It is given from 2 lb. to 8 lb. of beans and bran daily, besides an allowance of clover. The years of an ostrich's life are about as many as that of a man—forty, sixty, eighty, or one hundred, according to the constitution of the bird and the sort of life it lives.

MENDEL'S LAW OF BREEDING.

"The Hawaiian Forester" publishes the following highly interesting, valuable, and instructive address on "Mendel's Law of Breeding," delivered before the Hawaiian Poultry Association by Philip L. Weaver:—

For many years breeders of horses, poultry and pet stock, florists, and expert gardeners have been working with a conscious basis of the laws of inheritance. Like begets like is a general rule on which they have worked out their standard bred stock. Many experts have more or less clear ideas of the basis of their success, but often they had no power to generalise from their expert experience to crystallise their experiences into a rule or law of breeding. They are the so-called "practical" men who sniff at theory, not knowing that consciously or unconsciously every dealer with the laws of Nature must act on a theory before he can produce results otherwise than by pure accident.

Especially is this true with illiterate breeders of horses and poultry. Years of experience have taught them how to arrive at results in certain cases, but they cannot or will not give out any general rule on which the inexperienced can act with any understanding. I am impressed with the amount of literature published nowadays on the raising of domestic fowls, and out of that literature how little is based on clear thinking applied to the experience of the writer and clearly expressed.

Breeding from a Sport.

We know that the White Plymouth Rock was developed by a long line of breeding from a "sport" of the Barred Plymouth Rock fowl, itself an artificial variety produced by crosses of several existing varieites. We know that by careful breeding the barred colour was bred out of the strain until now White Plymouth Rock fowls breed true. When asked how this is done, too often the answer is not definite. The chicken men say, "By careful breeding." But what is careful breeding? Is there some mystery that the uninitiated are not supposed to know? Or is it that the expert himself does not know how to formulate rules of breeding for others to follow.

I propose to set down a synopsis of what scientific men to-day have discovered and believe to be a true law of breeding.

If the practical breeder will listen to the teachings of scientific breeders for more than forty years past, he will find a great light let into his groping task of establishing a new variety of plant or animal. This aid would apply to the poultry-man as well as to all other breeders.

I have read many works and papers on poultry and how to breed them, but I have not yet seen therein any reference to "Mendel's Law of Breeding." This law is now generally received by the most learned investigators to be established as a fact.

Abbot Mendel.

Abbot Mendel was an Augustinian monk, of Brunn, in Austria, who conducted extensive experiments with cultivating peas in his monastery. He published the result of his experiences in two modest papers about forty years

ago, but his work attracted little attention, probably because of the scientific excitement over the discussion of the Darwinian theory of the "Origin of Species" through natural selection. In 1901, De Vries in Holland, Correns in Germany, Tschermak in Austria, and Speelman in America, rediscovered the same principles of heredity independently, which are now known as "Mendel's Law." Dr. Castle and others have conducted extensive experiments with guinea-pigs and white mice, which have resulted in a demonstration of the truth of the law. I quote on this subject from a work by Metcalf on "Organic Evolution," page 44:—

CASTLE'S EXPERIMENT WITH MICE.

"Castle bred white mice and common grey mice together, and got the following results: The offspring developed from the first cross were all *apparently* normal grey mice. When, however, a male and female from this first lot of young were bred together, very interesting results were obtained. Three-fourths of the young of this second lot *appeared* to be normal grey mice, but one-fourth were found to be *pure white mice.* If two of these white mice were bred together they had white offspring, and the same was true in breeding again from their young, generation after generation, showing that they were of pure strain without admixture from the grey variety, though the original parents in the first cross were one grey and one white.

"It is of great interest to note that, in spite of the crossing of the two varieties, there appeared in the later generations certain individuals which were of pure blood showing no trace of the admixture which we would expect to find resulting from the cross. Extensive experiments in breeding showed that the results were to be interpreted as follows:—

RESULTS.

"A grey mouse G bred with a white mouse W gave offspring which seemed to be all grey, but were really a mixture of grey and white, the grey character being *dominant* and the white character *obscured* or *recessive,* as Mendel called it.

"That is G × W gave: G (W), G (W), G (W), &c., the parenthesis indicating that the white character was recessive. This hidden complex nature of the second generation (the young from the first cross) was clearly indicated when they were bred together. It was found that their offspring was of three sorts, and that these three kinds were in definite and numerical proportions.

"G (W) × G (W) gave offspring:

"1 G + 2 G (W) + 1 W: one-fourth being pure grey, one-fourth pure white, and one-half apparently grey, but really, as further breeding showed, grey and white, the white character being recessive and obscured. These numerical proportions held true for an extensive series of experiments in the case of white mice, as they had done in the experiments of Mendel upon certain plants."

SPORTS.

"Very divergent individuals which arise by variation are commonly called 'sports.' It is easy to see that if a single brood of sports arose which were especially well adapted to their environment, although they might breed with non-divergent individuals of the species, yet among the offspring of the third generation there would be individuals like the original sports."

From this statement of the rule it is evident that the breeder can by selection change the character of the species from the old type to the new type (represented by the sport) by selection and elimination.

It should be stated that Mendel, and Dr. Castle and others who succeeded him, found the rule not without exception, for Dr. Castle found that in breeding white and grey mice that a certain proportion of the offspring from the first cross were not grey or white, but dappled grey and white, and not as we would expect from Mendel's Law.

Having given a bird's-eye view of the subject, let us go more fully into Mendel's experiments in detail.

Mendel's Experiments with Peas.

He experimented with garden peas. All progeny from each cross were kept separate for a number of generations. He selected contrasted characters which are alternative. Seeds, round or angular; pods, wrinkled or smooth; stems, tall or dwarfed. Take, for example, his experiments in crossing peas differing only in colour of the cotyledons—viz., yellow and green. All the crosses resulting from yellow vines pollinated from green vines were yellow seeds only. There were found to be no green seeds, and no intermediate ones. This characteristic of the crosses is especially to be noted. Mendel applied the term *dominant* to the tendency of the yellow colour to dominate over the green colour. The green colour was suppressed in the first generation of crosses, therefore called this *recessive.*

All the seeds were then grown, and the plants of the third generation set seeds. It was found that the third generation differed from the second. They were found to be partly yellow and partly green in the proportion of three yellow dominant characters to one green or suppressed colour. The actual figures were as follows:—

Two hundred and fifty-eight seeds, apparently yellow, were produced by crossing yellow with green varieties.

Two hundred and fifty-eight hybrids, when crossed together, produced 8,023 plants—6,022 yellow species to 2,001 green species, or 3 to 1.

In the second generation, 519 seeds resulted in 353 yellow and green mixed and 166 yellow.

The result may be expressed as follows, D representing "dominant" and R "recessive":—

Ovules fertilised by pollen result in the following progeny combinations:—

$(D + R) \times (D + R)$, which is equal to:

$D^2 + 2\ DR + R^2$, which may also be expressed:

$DD + D(R) + (R)D + RR.$

The recessive or green seeds, RR above, when bred together, will not produce any but green seeds. They breed true. But the dominant seeds or yellow all look alike (the pure stock DD that when bred together breed yellow, true, and the D(R), (R)D, which are apparently yellow, but when bred together do not breed true). To separate the pure dominant stock, yellow, DD in the combination, it is necessary to test out the hybrids by self-pollinating each of the plants produced from the yellow seeds. The dominant class DD, or pure yellow stock, will produce yellow seeds alone, while the hybrids D(R), (R)D, apparently yellow, with suppressed green characteristics, will again produce yellow and green seeds in the proportion of 3 to 1.

Thus the DD, or pure seeds of the strain, may be tested out and used to breed true. This result reached by Mendel forty years ago was further tested and proved recently by Dr. Castle in experiments on guinea-pigs or cavies.

Experiments with Guinea-pigs.

He wanted some rough-coated, "rosetted" albino varieties. In order to produce these he commenced with cavies possessing rough-pigmented or coloured coat and albino smooth coat. Observe that the problem was complicated by two alternative characteristics. He had to breed not only for colour, as the peas were cultivated, but also for rough or smooth hair in addition. Experiments showed that the rough coat is alternative with and dominant over the smooth coat, and also that pigmented or coloured coat is dominant over white coat.

Crossing rough-coloured or pigmented with smooth albinos, it was found that hybrids were produced, all of which exhibited only the dominant characteristics—viz., the rough and coloured coat.

When bred together, the above resolve themselves up into nine categories, though the characteristics are not all apparent. In only three out of sixteen

offspring did the hidden or recessive characteristic of albino colour and smooth coat appear. The result of 3 to 1 was therefore demonstrated. The breeder using Mendel's Law would test each rough-coated albino for purity by crossing each with a smooth-coated albino, which contained recessive qualities only. The result would be that about one-third of the rough white cavies would produce to this cross only progeny similar to themselves. Others would produce mixed three rough and one smooth albino, and those would be rejected as hybrids.

By this test the individuals of the dominant character DD may be determined without any recessive character D(R), (R)D. They are pure, and will remain so.

Segregation and Dominant Characters.

From these experiments we have two elements—segregation in breeding, and dominant characteristics.

The mathematics of segregation is understood from the nature of the development of the germ cell, but the cause of the characteristic of dominance is a mystery. It is found to be an important element to be reckoned with.

Specific Results.

With these applications the law becomes a working rule, and poultry-breeders with others may intelligently breed in a characteristic with some precision and intelligence. A distinctive characteristic developed in a sport may be bred in to order, as was done by the breeder of the White Plymouth Rock, a "sport" of the Barred Plymouth Rock, an "albino", of that breed, which has become a standard variety.

The hit-or-miss system of breeding from large numbers of individuals to get a result may be reduced to an exact testing out of the individuals which will not breed true, leaving the purebred stock. There is no mystery about the process of creating a new characteristic in a variety when we understand Mendel's Law, now an accepted rule among scientific men, and poultry-men among others should understand it.

Briefly expressed, Mendel's Law may be stated thus:

In the second and later generations of a hybrid, every possible combination of the parent characters occurs, and each combination appears in a definite proportion of the individuals.

EGG-CULTURE.

Why does England import from 700,000,000 to 800,000,000 of eggs every year, and pay over £2,500,000 for them? The answer is: That the demand for eggs is steadily increasing, while the home produce is either lessening or stationary in amount. If a due attention to details were given in this State, the stock of fowls which roam about the farmyards and gather corn from the threshing machines, would return sufficient to discharge the rental of many a fair-sized homestead. Most small farmers keep a few fowls; but, taking them as a whole, what is the average number of birds per head of the population of Queensland?

The Government Statistician tells us in his report for last year that there are in all the State 752,704 fowls of all kinds. Taking the total population at, in round numbers, 500,000, we arrive at the result that we have 1½ fowls of all kinds per head of the population.

As regards egg-production, we find on the same authority that these fowls produced during the year 2,417,942 dozen eggs—that is to say, about 5 dozen eggs per annum per head of the population. Seeing, however, that roosters are included in the total number of fowls in the State, we must deduct at least one-tenth for non-layers, which reduces the yearly average per hen to about 3½ dozen, or about seven-tenths of an egg per hen per week. This brings us to

the conclusion that 52,000 eggs per week are laid, which will allow about one-tenth of an egg per week for every man, woman, and child in the State.

Where there are no pigs on the holding the fowls act as scavengers, consuming the scraps of the family, the outside cabbage leaves, potato peelings, &c. Now, if the fowls are supplied with regular mixed diet, they will lay a good many eggs. The desultory mode of leaving fowls to find their own food as best they may is quite a mistake, and can never be adequately remunerative. Fowls, to pay, must be well looked after and systematically fed and housed.

The importation of French eggs into England has increased to a most incredible degree. It has risen from about 150,000,000 to about 700,000,000 annually since 1860, while the value per 1,000 has also increased, until at length British importations cost the nation nearly £3,000,000 sterling per annum.

Egg-culture in France is almost exclusively confined to small farmers, who carry it on in a vigorous and commercial spirit, and chiefly in Burgundy, Normandy, and Picardy. Every village has its weekly market, to which farmers and their wives bring their produce in preference to selling it at the farm to itinerant dealers.

A merchant will sometimes buy 20,000 eggs at one market; he takes them to his warehouse, where they are sorted and packed, and possibly sent off the same day to Paris or London.

According to the conditions required by the buyers, the eggs are sometimes counted, sometimes "sized" by passing them through a ring, and sometimes they are bought in bulk. They are sent to England in cases containing from 600 to 1,200 each. It is found that the buckwheat districts are those on which most eggs are produced. This is worthy of note by Queensland breeders. The production of eggs for market is one thing, and the hatching of them another. Those who have tried artificial hatching and rearing of poultry have arrived at the conclusion that both eggs and poultry can only be produced on a paying scale by the farmers and by people living on small holdings, and this opinion stands to reason. About farmyards and cottages in rural districts hens can pick up food that would otherwise be wasted. Besides, let it be kept in mind that hens like to roam about, scratching for seeds, worms, and particles of lime to furnish material out of which the shells of their eggs are formed. If kept in confinement, exceeding care is required to supply the creature with such requisites as their maternal instincts seem to require. What we suggest is, that farmers and those possessing sufficient scope for keeping poultry should go far more largely into the business of egg-culture than they do at present. Why should they allow the great egg supply for England to be in the hands of others? The answer, we think, is: That our farming classes generally look down contemptuously on the supplying of eggs for market. It is, they think, too small an affair to invite consideration.

Too small! Three millions of money carried off by the French!

Is that a trade to be treated with indifference?

Lately, we have been hearing a great deal about women's work, and of how young ladies should employ themselves. Here is something, at all events, for farmers' wives and daughters to set their faces to without the slightest derogation of rank, dignity, or character. Let them take up in real earnest the culture of fowls, if only for the sake of the eggs, which, on a great and remunerative scale, may be produced. Those women who already appropriate a portion of their leisure to this occupation deserve all honour, far more than those who spend hours over fancy work or weeks at the piano with the sole object of gaining a doubtfully valuable musical diploma.

Such refinements are undoubtedly very excellent things in their way, but, carried to excess, they are harmful, and tend to draw people away from many light and pleasant rural pleasures which were the pride of the country-women in times not very long ago.

The Orchard.

PINEAPPLE MANURING EXPERIMENTS.

In April last we published some results of experiments in manuring pineapples which were carried out by Mr. A. H. Benson, in conjunction with Mr. J. C. Brünnich, Agricultural Chemist, in the Nundah, Nudgee, and Clayfield pineapple fields. This was in continuation of preliminary work in January. We are now in a position to supply further information on this important work.

From Mr. Benson's interim report, dated 19th August, we take the following further results:—

Mrs. Stuckey's Orchard—Clayfield.

The plants have stood the winter well. Those covered with Hessian are not of as good a colour as those covered with grass in the ordinary way. Where complete manure has been given, the plants show signs of coming into flower shortly. The plot is in good order.

Mr. Corbett—Nundah.

The plants look well, particularly where complete manure has been given. The land is in good order. The most advanced plants show signs of coming into flower. The plants suffered no injury from the winter. This plot will be green manured.

Mr. Gollacker—Nundah.

The plants are not of too good a colour, but otherwise have stood the winter well. They have not made as good a growth as Corbett's. The land, being very deficient in humus, is to be green manured.

Mr. J. Atthow—Nudgee.

The plot has come through the winter well. The rows are very even. The whole plot is to be manured with complete manures, and one-half of it to be limed.

The complete manure will contain—

$$\left.\begin{array}{r}\text{75 lb. of nitrogen}\\ \text{75 lb. of phosphoric acid}\\ \text{150 lb. of potash}\end{array}\right\}\text{ per acre.}$$

There will be two series, one consisting of a mixture of—

Sulphate of potash, sulphate of ammonia, and superphosphate; and the other of

Sulphate of potash, dried blood, and Thomas's phosphate.

One row of each manure to be applied at one-half strength, and half the land to be limed at the rate of 2 tons of unslaked lime to the acre.

These experiments should show on the summer crop of fruit, as this plot of plants will bear fruit this coming season.

OLIVE-GROWING.

Although the olive-tree thrives in all parts of the State, and bears excellent fruit in large quantities, there has been no attempt made to grow olives for profit. The olive-trees at St. Helena have long been noted for their heavy crops, from which excellent oil has been occasionally made, which found ready purchasers at from 10s. to 12s. per gallon.

A gentleman from New South Wales was in Brisbane last August, who stated his intention of shortly taking up land with the object of growing sisal and olives. Should he carry out his intention, he would put in 5,000 truncheons to begin with.

The following note on "Olives for Profit" appeared in the South Australian Journal of Agriculture (7th August):—

Mr. G. F. Cleland, proprietor of the Beaumont Olive Plantation, states that from 14 acres he has this year harvested 40 tons of olives, worth £8 per ton. The cost of picking amounted to £120, leaving a return of £200 from 14 acres. With a view to encouraging the planting of olives, Mr. Cleland recently offered to supply free of cost olive truncheons, and as a result received application for 4,000, there being over 100 separate applicants, who were only asked to pay cost of carriage. The truncheons, which are about 12 inches long, should be trimmed slightly at each end with a sharp knife, and be placed across (not stuck in the ground like a vine or rose cutting) a well-dug nursery-bed or trench, about 15 inches apart. They should be covered by about 3 inches of good soil, and the beds should be kept clean. The truncheons usually send up shoots at each end, and unless the first year's growth is particularly strong it is advisable that they should not be transplanted for two years. When taken out of the ground the truncheon is sawn in the middle, and sometimes the stems and roots are so numerous that by the application of a fine saw each end can be converted into two trees. When they are transplanted, the trees should be put 24 feet apart. If the summer is dry, the truncheons will be benefited by an occasional watering.

STRAWBERRY PROBLEMS.

There are certain points of similarity between the cultivation of the strawberry in Europe and in the cool districts of Queensland, and some of the cultural problems which have occupied the attention of strawberry-growers in the old country may well be studied by Australian growers. One of these problems is the fruiting of the plant the first year after planting. One of the faults of the strawberry (says an English exchange) is its free and generous nature, yielding, as it does, readily to the cultural restraints put upon it. This is, in a sense, unfortunate, as some growers seem to think that any treatment will do for the strawberry. There is, at least amongst amateur growers in this State if not amongst those who produce strawberries on a commercial scale, a certain amount of rough-and-ready treatment of the plant—especially as regards propagation—that gives it no chance to crop heavily within a short period, and necessitates its being grown for two years before it can give a good return. The better a valuable plant grows (says Mr. Walter P. Wright, in "The Journal of the Board of Agriculture") the better we ought to treat it, for, if in nature and habit it be strong and kindly, it will prove responsive to good treatment. Experienced growers do not need to be told that the quick or slow fruiting of a strawberry plant turns on the readiness with which it forms a "crown." The crown is the thickened heart of the plant, on which it concentrates itself—root, stem, and leaf. If we examine a strong strawberry plant just after blooming in summer (or spring), there will be no crown worth speaking of, because it has burst and produced flower stems and blossoms; there will only be leaves and roots besides the flowers. If the same plant be examined again in autumn, another thickened heart will be found to have formed—that is, the plant is preparing itself for another year's fruiting. As a rule, the crown is only half-finished then, and between November and June it will thicken and solidify in a very marked degree. If the soil be good and root-production vigorous, a plant which shows only a small crown, the size of a large pea, in October, may by the June following develop a heart as big as a large thimble, and produce a good cluster of large flowers. The common idea that a strawberry plant cannot form

a really strong fruiting crown in its first year, and every year, is wrong. Many market-growers argue that a young strawberry should be grown two years before it is fruited, in order to get a strong plant; but, if a strawberry crop be properly managed, it will give an appreciable amount of fruit the first year, and make just as good a plant the second as the average of those which most growers produce in two years. That this holds good for Queensland is undoubted; we have obtained a very good crop of the "Aurie" in the first year. The importance of this lies in the fact that we get a turnover on capital a year in advance. The explanation of the fact that a considerable section of market-growers adopt the one-crop-in-two-years' system with young strawberries may lie partly in the fact that they have their employees very full of work when the first runners come in summer and comparatively slack in autumn. They thus do not trouble to take the early runners, but take late ones in October or November. On this two comments may be offered: The first, that one quick man (or woman) can take several hundreds of runners in a few days; the second, that the period of three months thus gained has an immense effect in helping on the development of fruiting crowns.

PLANTING EARLY RUNNERS.

Those who grow strawberries for forcing invariably make a point of getting early runners, because experience has taught them that only by this means can they be sure of getting plants with plump, well-developed flowering crowns within a few months. They like to get the first plant on each runner. It is not the fact, as is sometimes asserted, that if a runner, after forming its first plant, goes on to form a second and a third, the latter are worthless, and likely to give barren plants. If a parent plant be itself barren (in the sense, that is, of not producing flowers when it has grown to a good size) it is certainly likely—nay, almost certain—to give progeny that is also barren. But what we may term secondary runners are not necessarily barren if the parent is fertile. While stating this, however, I still think that the man who wants quick-fruiting plants should pounce down on the first plantlet which shows and secure it.

Runners may begin to push in May or June. They should be allowed to remain if the plants are strong ones; but they should be removed if the plants are weak. A backward plant under a year old, concentrating itself on the development of its first truss of flowers, should be denuded of its runners directly they show. Ripening a small crop of fruit will put quite sufficient work on the plant without subjecting it to any further strain. But stronger, more forward plants, which have had abundance of time in which to form their crown, will be quite capable of developing a crop of fruit and forming sturdy young plantlets at the same time.

The plantlet forms on the runner at a distance of a foot, more or less, from the parent. The end of the runner will thicken, a mass of brownish roots will form round it, and little green growths, soon recognisable as leaves, will begin to push out. This is the embryo plant. If we neglect it, it will proceed to push out roots in the soil, and, having established itself, to throw out a secondary runner, which will produce a plantlet in its turn. The main runners—those which spring direct from the plant—are the strongest, and the first plantlet the best. These are the ones that the forcer takes, and these are the ones any grower should secure who wants to have fruiting plants the following year.

REPLANTING EVERY THREE YEARS.

When the grower goes in for early fruiting plants, he finds himself committed to what I believe will be the method of the future—annual summer propagation, high-pressure cultivation, three crops at the most, and then—a new plantation. The more experience he has of the system, the more it will grow in favour. The temptation to keep old beds and save the trouble and expense of making new ones is too strong for some amateurs, but trade-growers

get it knocked out of them by painful experience. A strawberry plant is generally at its best in its second year. The third shows a decline, which may be only slight, or may be strongly marked, according to the quality of the soil. It may be said that this decline can be arrested by manuring, but herein lies a difficulty. Merely spreading on a mulching of manure or turning manure in between the rows is not sufficient, and the only resource is to make new beds. It may be taken as established that it is more economical to do this than to endeavour to maintain the productiveness of old ones. A comparison of the length of time the ground is occupied by plants fruiting for the first time in the first and second years respectively, each set fruiting three times, shows the advantage of the first method, as follows:—First method: Plants struck early in 1907, and fruited in the summers of 1908, 1909, 1910, and then done away with. Second method: Plants struck late in 1907, grown on in the summer of 1908, and fruited in the summers of 1909, 1910, 1911, and then cleared away. Thus the second set would be in hand one year longer than the other, and, in order to balance accounts, it should give proportionately more fruit.

Manuring.

A problem hardly less important than that of early or late propagation is that of manuring. Even trade-growers themselves, who do not eat the fruit which they cultivate, but are mainly concerned in growing as much as possible of marketable quality, are beginning to point to the softness of flesh and coarseness of flavour which accompany the very heavy dressings of yard manure that are now the rule. Since it is so difficult to maintain the fertility of a strawberry bed by subsequent manuring, the grower is naturally anxious to "do" his soil well at the outset, in order that the plants may have something to feed upon for three or four years. This is the explanation of the heavy manuring that is practised. The alternative is to reduce the bulk of the manure and supplement the fruit-forming constituents with certain chemicals. These fruit-formers will not be found in nitrates, and the grower who adds nitrate of soda or sulphate of ammonia to his yard manure is simply stimulating leaf growth and wasting his money. Assuming that the dung used is of good quality, it will yield all the nitrates that strawberries want without any addition. It is to phosphates and potash that he must turn for his supplementary fertilisers, and if he use them with judgment he will find the results satisfactory. The value of mineral superphosphate, costing about £3 per ton (£6 per ton in Queensland), is altogether unestimated by strawberry-growers. A fair commercial sample will yield about 26 per cent. of soluble phosphates. A reasonable rate of application for strong land is to allow 28 lb. for every ton of manure if 25 tons or over are applied. Thus, if 30 tons of manure were applied per acre, the quantity of superphosphate would be 7½ cwt. exactly. At £3 per ton this would cost £1 12s. 6d. (at the Queensland price it would be £3 5s.), which can easily be saved out of the manure, for 30 tons per acre is often exceeded. If the manure applied should be less than 25 tons, the quantity of superphosphates per ton might be increased to 35 lb.

Character of Soil.

In this matter of manuring the grower must be guided by the nature of the soil. Strawberry-growers in this State have the advantage of naturally rich, fertile soil, such as the scrub soils at Mapleton and Montville, at Mooloolah, and also at Wellington Point, Cleveland, &c. Consequently the question of manuring is not at present of such vital importance to them as it is to growers in the old country. Strong loams do not require anything like the manure which light land does. If such land lie fairly warm, it is almost ideal strawberry soil. One great thing in its favour is that it holds moisture well, and a moisture-retaining soil never requires so much manure as land that quickly "dries out." Those who grow strawberries on light land will be wise

to supplement farmyard manure with a selected potash fertiliser. Sulphate of potash (cost in Queensland, £18 per ton) is excellent, and the fact that it is relatively expensive need not deter the grower from using it, as the quantity needed is not considerable; ¾ stone (10½ lb.) per ton of manure will suffice. Like superphosphate, it may be drilled in before planting, or mixed in with the manure while the latter is rotting in the heap.

The reason why most varieties of strawberries do not thrive in light land is that it is not moist enough. Merely adding manure will not make it right, though it will improve matters. What is wanted is deeper culture. Heavy land is supposed to be more expensive to work than light land, but if a proper profit and loss account were kept it would be found that stiff soil pays better for strawberries than light. Mr. Wright says he has not yet found the clay (which so many strawberry-growers dread) that is too stiff for this fruit, provided it is drained. The vigour that most varieties display on stiff land which receives but a limited quantity of dung is remarkable. A dry season, so trying on light land, has very little effect on plants in stiff soil.

My conviction that heavy soil is more economical than light for strawberries, taking into consideration durability of the plant and yield of fruit, is based on some amount of experience. In handling light soils, I found that only by trenching and heavy manuring could a plant be kept going for even three years. This makes culture an expensive item. If I had a warm situation, I should never hesitate to plant strawberries on clay, and I do not think that the objection which many growers have to this class of soil is well based. Such land has sterling qualities, it produces plants of immense and sustained vigour. The one serious objection is lateness, but this is most marked where the situation is unfavourable. Clay with shade, or clay on a northern slope, must stand condemned.

In view of the large quantities of yard manure now used for strawberries, it behoves growers who have cause to complain of scanty crops to think twice before they condemn the plants as going barren. One sees strawberries making an immense amount of top sometimes, and yet when examined the crowns are found to be small. This may be the result of over-manuring rather than of an inherent tendency to barrenness; anyway, a dressing of quicklime scratched in at the rate of 3 to 4 tons per acre cannot possibly do any harm, and is very likely to do good. It should be followed by a dressing of superphosphate at the rate already mentioned. A good time to apply this is February.

CULTIVATION FOR ONE CROP ONLY.

What gardeners term "culture as annuals" is beginning to engage the attention of growers, and it may be well to consider this system, which is certainly spreading in private gardens. "Culture as annuals" means that the plants are pushed rapidly on from early runners, fruited once, and then done away with. This seems somewhat revolutionary, but, when one considers all the circumstances, it has a good deal to commend it for private gardens. The crop falls in with the rotation of a large kitchen garden almost as though it were a vegetable. For instance, a gardener may take a crop of early peas or potatoes from one of his kitchen garden quarters in July, manure the ground, and have it ready for strawberries in August. The following year he will be able to gather his fruit by mid-July at the latest, unless the variety is a very late one, dig the plants in, and plant a crop of savoys or sow onions. I have been astonished at the magnificent plants some growers turn out in a year; even experienced cultivators might be deceived into thinking they were at least two years old. While, however, the system is quite practicable in a private garden, a little reflection will show that it is not so suitable for market-growers with large cultures, unless (1) their land is of the best, and (2) they can command a special price for a limited quantity of fine fruit. These "biennial" plants do not, except in special cases, yield a great bulk of fruit, but produce

a few very large and juicy examples. If the grower could find a special market for selected fruit at an enhanced price, he might have no cause for complaint, but ordinary rates would not be remunerative. There is, too, the question of the previous and successional crops to consider. The strawberries go on the ground one year and come off it the next, at a period when only a limited number of vegetable crops are available for clearing off or planting, as the case may be. I do not seek to condemn the "once-fruiting" system. It is interesting, and is conducted by many gardeners in a way that redounds greatly to their credit. But I am not quite sure that it could be carried out with equal success by the rank and file of market-growers. Anyway, they will be wise to look at it in all its bearings before they put much money into it.

The Queensland strawberry-grower must understand that the months and seasons given above refer to European countries whose summer months are our winter months.

Apiculture.

AUSTRALIAN HONEY IN LONDON.

A shipment of 7 tons of honey was recently made to London through the South Australian Export Department, says "The New Zealand Farmers' Union," and another consignment was to follow in a week or two.

The Southern States' Commercial Agent in London advises having sold a small lot of specially selected honey at 30s. per cwt., and that "he has every confidence in the prospects of a payable market being established for their product in London." The price is anything but tempting. French honey averaged 50s. per cwt. in London last year, but that from the United States, which constituted a quarter of the total imports, only averaged 25s. 6d. Further down the list came the British West Indies, whence nearly half of the whole imports of the United Kingdom were drawn, with an average of 22s. per cwt.

CONTENT OF A STACK.

Mr. D. Ritchie, Cooroy, sends us the following rule for ascertaining the content of a stack, which he rightly thinks is simpler than the rule we gave last month in reply to "Victorian":—

1. How many cubic feet are there in a stack 40 feet long, 12 feet wide, 14 feet high—8 feet to the eaves?

$14 - 8 = 6$

$\frac{1}{2}$ of $6 = 3$. Then $3 + 8 \times 40 \times 12 = 5{,}280$ cubic feet.

2. How many cubic feet are there in a round stack 21 feet high, the upright sides being 12 feet and the diameter 12 feet?

$21 - 12 = 9$

$\frac{1}{3}$ of $9 = 3$. Then $3 + 12 \times 12 \times 12 \times {}^{\cdot}7854 = 1{,}696$ cubic feet.

3. For a square stack measuring $15 \times 12 \times 12$, multiply the three dimensions together. Thus—

$$15 \times 12 \times 12 = 2{,}160 \text{ cubic feet.}$$

The above rules are taken from Howard's "Art of Reckoning."

We are continually being asked—usually by non-readers of the Journal—for rules for determining the volume of stacks, dams, tanks, &c. We would suggest that when such rules are published those interested copy them out into a notebook for reference.

The Angora Goat and Mohair Industry.

By Mr. W. R. ROBINSON.

(A paper read before the Toowoomba Chamber of Commerce on 12th February, 1907.)

Some four years ago I gave a short paper on "The Angora Goat and Mohair Industry" at an agricultural conference held at Maryborough, and am pleased to say that it was very favourably commented upon by many practical men, and from the numerous letters I received from all parts of Queensland, New South Wales, Victoria, and as far south as Tasmania, asking for further information about the industry, and where good Angoras could be obtained, it naturally made me take a very keen interest in what I believe is going to grow into a very large and profitable industry, not necessarily on the fertile agricultural lands of the States, but on the rough undergrowth and thickly timbered areas and drier belts, which are unsuited for cultivation, sheep raising, or dairy farming—land that can be had at small cost and on long terms. The goat will thrive where another beast will starve, simply because it is their habit to brouse on shrubs, weeds, leaves, bark, &c., with grass for tonic, whereas other stock merely eat a very few varieties of shrubs for tonic, except in times of extreme drought, when they are driven to extremes.

Some years ago there were some beautifully bred Angoras at Talgai and one or two other places in the State, but unfortunately in those days they were little thought of and allowed to dwindle out. To-day they would be worth some hundreds of pounds, and, like many other good things started in Queensland, we have not realised their value until we have carelessly let them slip through our fingers.

An American Opinion.

Professor Thompson, of the United States "Bureau of Animal Industry," says:—"So far as history enlightens us, the goat has always been one of the best known domestic animals. How long he has been in disfavour simply because he was 'nothing but a goat,' and has been the subject of every funny man's joke, we are unable to say. The oldest accounts show him to have been a most useful animal in the furnishing of hair for curtains, skins for clothing and tents, and meat for tribes, yet down to this day he has been maligned beyond reason, and that, too, by those who have worn his skin as gloves, and shoes, and capes, his hair as the finest of furs and expensive dress goods, and eaten his flesh as delicious lamb. There has recently been an awakening in the mother States, especially among those who are very ready to welcome and to dignify any industry that is honourable and bids fair to pay dividends; and so it is that the Angora goats, the finest breed of the goat family, are now receiving the credit that has long been their due."

Movement in Australia.

Not only in America is this industry fast being taken up, but in Australia many are now paying attention to it and doing well. We now have some flocks which the owners have reason to be proud of. Notably E. A. Scammell, of South Australia; R. Blaxland, New South Wales; H. Missing, near Maryborough; H. Philp, Grantham; J. R. Chisholm, The Prairie, North Queensland; and, coming nearer home, G. H. Simpson, of Torrington, Toowoomba, who has just imported six of the best goats yet brought to this State, and is starting a stud on good lines. To say there are any absolutely pure Angoras in America or Australia would not be correct, because it is a well-known fact that in 1881 the Sultan of Turkey issued a decree that there should be no further export of Angoras. What is to-day called the pure Angora is the result of crossing and recrossing, until conformation, points, &c., have attained to what is generally considered the thoroughbred Angora ought to be. The Angora seems to adapt

itself to almost any climate, and thrives well, no matter whether the thermometer fall to 5 degs. or 10 degs. below zero or rises to 90 degs. Fahr. The main thing to avoid is a low, damp, humid climate. Goats of all breeds are averse to damp, and it is no uncommon thing to see them scampering to shelter when a shower comes on.

Goats as Land Cleaners.

As land cleaners goats have no equal. They are constantly at work, and it is wonderful how they will convert dense undergrowth into rich grazing land. We have any quantity of suitable land in the State that would benefit by being cleaned up by flocks of goats, and at the same time the owner would not only have his country improved, but would have a clip of mohair and good mutton as well. So far little in this way has been done out here, but in the United States they have done wonderfully good work. One writer says:—"The work they have done is beyond my expectations, and what has been said about their efficiency as brush or land cleaners that I have read or heard of has not been overdrawn." Another writer says that "in the Hawaiian Islands they are being used to eradicate the lantana." If they are successful in keeping down this pest, our farmers on the North Coast line should try the experiment, and I have no doubt a great amount of good would result.

Starting a Flock.

It is not to be expected that anyone starting a flock would launch out and buy all purebreds, as this would run into a considerable sum and probably beyond the means of many of the smaller men; and, on the other hand, there are not many owners of good goats who would care to part with their best does. Therefore, the easiest and least expensive way is to grade up a flock. This can be done in the following way:—Procure a buck of good quality from a standard flock; these can be got at from £5 5s. to £15 15s. each; of course you can get a good-looking buck (probably about half breed) for £1 or £2, but if you are going into the business at all, start with a good sire, and you will reap your reward in the price of your clips of mohair much sooner than the man who starts with an inferior sire. Purchase one or two pure does to mate with this buck, so as to produce some good young bucks to put to work later on. Secure some first-cross does, or even common white does—these can be got at a few shillings per head; but when buying do not select the long coarse-haired ones—always pick those with the shortest and finest hair—and for this reason: This short hair in mohair is known as "kemp," and the shorter you can get it, and the freer your mohair is from it, the more valuable will be your clip. The buyer of mohair gauges his price on the length and quantity of kemp present, so if you can produce a good staple of lustrous fine mohair, free from kemp, you can depend on always obtaining a good price. The buck should be as free of kemp as possible, so when selecting him handle him carefully, opening up the long silky locks of mohair, and look for the short, thick hairs that lie close to his skin; the less he has of these the better. These does crossed with a good buck will produce first grades, from which you select your does, and so you can go on and build up with careful management a flock of high quality. The young grade bucks you will convert into wethers as you would do lambs; they make the best of mutton, and their skins are valuable for mats and rugs, until you have so bred up that they will pay you to clip.

I have here some samplesof mohair—one from a South Australian bred goat, and the other from a Tasmanian. The former is a good sample, fine as silk, and of very fair length, worth about 2s. to 2s. 6d. per lb.; the other, although of good length, is coarse, wanting in lustre, too kempy, and would only be used in the manufacture of carpets and horse-blankets; whereas the former would be used for fine fabrics. To say what mohair is worth is difficult, as there are as many grades of mohair as of wool, and little effort has been made by mohair producers to class their clips, but I hope more care will be taken.

THE DEMAND FOR MOHAIR.

The demand for mohair is good, and there is every probability of an increasing demand, as new uses may be developed. "The American Wool and Cotton Reporter" states that, with an increased production of Angora goats in this country and the consequently enlarged introduction of mohair, the latter is going to be consumed more largely than heretofore, and is indeed already "cutting more of a figure in the wool market."

The great beauty of mohair is the lustre, which remains in the manufactured article, and no amount of washing or dye will remove it—in fact, it aids the dyes to show their colours more effectively, and, however much exposed, they will not fade.

Angoras in some countries are shorn twice a year; the yield, of course, as with sheep, depends on the quality of goats you are grading up. I should think shearing once a year sufficient in this State. It is all a matter of management on the part of the producer; if his goats are good, and showing 8 to 9 inches of hair, it might be preferable to clip twice in the year, so as to prevent the hair matting.

CARE AND MANAGEMENT.

As with all domestic animals, to get best results they require good care. Generally speaking, they are hardy, and thrive well as far north as Alaska, and in the extreme heat of Guadalupe Island, so there is no reason why they should not do exceptionally well here, so long as the owner uses ordinary common sense in managing them. They will breed at five and six months old, but it is far better to allow them to come to maturity, and not to breed from them until they are twelve or fourteen months old. They are in their prime from two to six years, and have been known to breed up to fifteen years. Old goats produce mohair of a coarser quality, which consequently is of less value than younger goats. The age is determined the same as sheep.

BREEDING.

It is generally agreed that in-and-in breeding produces the finest quality of mohair, having all the beautiful lustre and little oil, but then you must bear in mind that you are reducing the size and constitution of the animals. The period of gestation in goats is 150 days, and care should be taken to mate them so that the kids are dropped in the warm months, as they are delicate for the first few days. It is not an uncommon thing for does to produce twins, but the higher the standard of your goats the less twins are produced. The average percentage of kids in large flocks is about 70 per cent., but with small flocks and care you should have 95 per cent. to 100 per cent. At kidding time the does should be kept at home and in small areas, as they are given to roaming in the larger areas and lose their kids. Goats require plenty of fresh air, so it is unwise to crowd them in small yards with shelter-sheds that do not give them plenty of room. Good fleeced goats require dry sheds rather than warm ones. In close quarters they are given to bunting, but do little harm. Some breeders in America have practised dehorning, but there is a diversity of opinion as to the benefit; it certainly deprives them of their only means of defence.

SHEARING.

Shearing should not be delayed until the goats begin to shed, as the mohair loses its lustre, the skin itches, and every effort is made to get rid of the fleece. You can use your own judgment about shearing twice a year. It is allowed you get a little more in weight, but as against that your length of mohair is less, and the price falls accordingly. Shearing machines are the best to use, and goat-owners find it to their advantage to use them. The fleeces should be kept as clean as possible, carefully rolled, but never tied with string, as manufacturers complain sorely about this practice. Dalgety and Co., Sydney or Brisbane, will be pleased to handle what mohair you have got for sale.

Not Liable to Disease.

Goats are less subject to disease than other animals, but when you notice a weak one in the flock be careful to isolate it for a few weeks until it regains its strength. The stronger goats are given to bunting the weaker, and they get down and are trampled to death.

Mohair.

Mohair is the technical name for the fleece of the Angora goat; it is a hair pure and simple, and differs from wool, as it has not the felting properties of that product. The average wool fibre (according to Dr. McMurtie, of the United States Department of Agriculture) stood a test strain of 108·79 gr., while mohair fibre stood a strain of 295·11 gr. This is a difference of 186·37 gr.—much more than double the strength of wool. It is to this strength of fibre that the great durability of mohair goods is ascribed. In stretching quality there is but a slight difference between mohair and wool. The fleece of a good Angora goat should be pure white and exceeding lustrous, attain an average length of 8 to 10 inches, and should hang in wavy curls or ringlets from all parts of the body. It is a fact known to practical breeders that goats have two coats of hair; the outer and more abundant is the mohair, and the under coat a coarse, chalky, white, straight, stiff hair, which varies from ½-inch to 4 inches. This under hair is known as kemp, and is believed to be a relic of the common goat blood, and, as pointed out previously, this is what all breeders should try and breed out as much as possible. It reduces the value of your mohair, and is objectionable to the manufacturer; and why? Simply because it will not take the dyes used for mohair; the only effect of the dye is slightly to discolour the kemp. There are dyes which act upon kemp, but they have no effect on the mohair, and no dye up to the present has been found to act satisfactorily upon both. There is a use for kemp and short mohair, as I have before stated. It is used principally in the manufacture of a cheaper class of goods and fillings for carpets, &c.

I have here some beautiful samples of mohair and fabrics manufactured from mohair. These have been very kindly lent by Mr. A. Dowling, of Talgai West, who collected them during his visit to the Bradford mills in England. They convey to you the value of the industry at a glance. The sample of hair is from Lake Van, province of Angora, Asia Minor, the original home of the Angora goat. The hair is of beautiful quality, and more like silk than hair. Mohair top or combed mohair is that from which the thread is spun; this is also as fine as spun silk. The other samples show spun mohair for braids, &c., Astrakan, delicate tinted dress fabrics, and the undyed articles. The other samples of mohair I have collected are from the Cape, which have been kindly scoured by Mr. Hawkins, are of a fine lustrous quality, and would sell readily in the English market.

Tasmanian Sample.

The Tasmanian sample is of a much coarser kind, consequently of a lower value. The South Australian samples, from a buck and doe lately purchased by Mr. G. H. Simpson, are both very high class, showing beautiful lustre and fine length of staple, considering they were taken from goats barely ten months old. A sample of locally grown hair from Mr. John Long's goats is well worthy of note. It is a very fair sample, and if all the mohair produced in this State was equally as good it would sell readily. From some of these samples I have picked out a few specimens of the kemp already alluded to, and when seen side by side with mohair it is not difficult to realise why every breeder should aim to have as little of it as possible.

Record Price.

The record price for Australian mohair is 4s. 2d. per lb. This price was lately realised by Blaxland and Knox, of New South Wales, for a fleece from their imported buck Perfection, the fleece weighing 9 lb. 8 oz.; and the skirted

portion, 6 lb., was forwarded to a New York merchant, who paid 1 dollar (4s. 2d.) per lb., leaving a net return of £1 0s. 2d. Several small consignments from this State are now on their way home, consigned through Dalgety and Co., and I hope the owners will do well with them.

In America.

In America there are about 300,000 Angoras, and the industry is a thriving one, so much so that the Departments of Agriculture take a very considerable interest in fostering the industry. Cape Colony, in 1900, had 4,000,000 Angoras, and exported £450,000 worth of mohair. These figures should make people in this State think.

I am pleased to see the Department of Agriculture this year are issuing forms to be filled in showing the number of Angora goats in this State. This will be of great interest later on.

Angora Mutton.

It may seem strange to many in a country like this, where sheep are so plentiful, that this point should be touched on; but during my visit to Townsville show last year I saw as fine a lot of grade Angora lambs, bred by Mr. J. R. Chisholm, as anyone would wish to see. He exhibited them alive, and had a number of them killed, dressed, and hung up amongst a number of crossbred lambs. I venture to say 99 out of every 100 persons who saw them could not pick out the Angoras. They dressed beautifully, and were sold to a leading butcher, who supplied them to some of the best people in the city, and I guarantee they never tasted anything better. He also told me that he bought them regularly at 12s. 6d. each, and there was a good market for them. Of course goat meat is always associated with prejudice of the common "ill-smelling billy," but anyone who knows anything about Angoras will tell you they are free from goat odour, and their meat is totally different from that of the common garden variety of goat; it is finer, carries more fat, is smaller in the bone, and more like merino lamb than anything else. In parts where sheep will not thrive no man need be without good mutton if he keeps a few Angoras. The does are not equal as milkers to the common goat, but many good milkers are to be seen in various flocks. Their milk is very rich, and many writers state that it is more nearly equal to human milk than that of any other animal. It is an old saying but a true one, that "a goat will thrive where a sheep will starve," and, further, goats are thriving in districts where cattle are dying of redwater and ticks, and it is a rare thing to find a cattle tick on them. This being so, I think the industry of which we know so little at present is worth more than passing attention.

Tropical Industries.

LIGHT MANURES AS A FACTOR IN AUSTRALIA'S SUGAR PRODUCTION.

By J. MONTGOMERIE HATTRICK, F.H.A.S., N.D.A.

The author of the pamphlet from which we take the following extracts prefaces his work by pointing out that the deportation of kanakas from Australia and the introduction of highly paid white labourers adds one more strong argument to the already long list of pleas for better and more intensive methods of cane culture. The practice of robbing the land which has hitherto obtained more or less generally, and the insufficient and ineffective tilling and cultivation which have been the rule rather than the exception, might suffice so long as

black labour, even relatively highly paid black labour, was available, but cannot under the now prevailing conditions, which must compel the growers to concentrate their attention more strongly than heretofore upon producing the maximum quantity of sugar per acre at the minimum of cost. It is with the express object of bringing to the notice of growers light manures as one means towards the attainment of this end that this little booklet has been written.

The pamphlet is issued by the agricultural offices of the Potash Syndicate, Sydney.

Sugar-cane, says the author, has been grown continuously on the eastern coastal belt of Australia for the last forty-five years, and during that time its cultivation has gradually spread northwards until it now extends from the Northern Rivers of New South Wales to Port Douglas in Northern Queensland. The peculiarly high original fertility of the rich alluvial and volcanic soils which occur over the major portion of the various sugar districts of this greatly extended region, and the very large areas of land available, explain to a certain extent the slow progress which has been made with the scientific cultivation of the crop here as compared with other important cane-growing countries of the world. There are cane-growing lands on the Northern Rivers of New South Wales—as, for example, the Clarence—which have been under cultivation for at least thirty years, and which have not yet received a pound of manure, although they naturally have produced slowly diminishing crops for many years.

And the same holds good throughout the greater portion of the sugar-growing belt. There are, it is true, alert and progressive men here and there who have experimented upon artificial manuring of sugar-cane for years, but they are merely the exceptions which prove the rule.

Seven years ago, when Dr. Maxwell had completed his preliminary investigation into the condition of the sugar industry of Queensland, he strongly emphasised this point. In his official report (page 9), Dr. Maxwell says:—"In every district, from Cairns down to the Isis, recollections are preserved of the crops that used to be grown. It is not necessary to dwell upon the items of yields where 70, 80, and even 100 tons of cane are said to have been obtained: it is ample for our needs to have before us the common evidence of the virgin fertility of soils as expressed by the ordinary production of 40 to 60 long tons of cane per English acre. It would be as much out of place to doubt these records of earlier crops as to question the act of cane-growing as a past matter of fact. The scrub lands of North Mackay, as well as Mackay's alluvial lands, have borne the average of 40 to 50 tons of cane an acre. Bundaberg claims to have done as much, and probably more, whilst Isis is still dwelling upon its enormous virgin yields of only five to eight years ago. And what is the situation as set forth by the returns and state of the crops to-day? We have in the course of the investigations conducted in each district endeavoured to procure data enabling a reasonably accurate reply to be made to this question. It has not been possible to obtain full returns of all the respective districts, yet the figures furnished are ample to indicate the situation as it at present exists:—

Districts.	Number of Growers.	Number of Acres.	Yield per Acre.
			Tons.
Bundaberg (Isis)...	184	7,326	22·7
(Bundaberg)	93	4,362	18·1
Mackay	...	18,000	10·8
Cairns	124	5,270	20·1

"The yield per acre of Mackay, which is the oldest sugar-growing district, is lamentably low. Mr. Chataway, however, states that the total area of cane crushed in the district during the last year was 20,000 acres, and the yield of sugar per acre was only 0·88 ton; and, further, that the average yield of sugar per acre during the past twelve months has been only 1·28 ton. The returns

of certain individual farmers in North Mackay show a production reduced to merely 4 or 5 tons of cane per acre, whilst in certain of the other districts yields of 7 and 8 tons per acre are recorded. The bitterness and depression of hope which these statements must have cost attest their claim to be accepted. These data, then, put before us a more or less adequate statement of the situation as it is found to-day, and they furnish a most palpable view of what has transpired since the period when the sugar-producing areas were virgin soils and yielding the large crops that have been stated."

This serious falling off in yields is attributed by Dr. Maxwell to three main causes—(1) removal of elements from the soil by cropping, (2) poor cultivation, and (3) diseases to which soil exhaustion and consequent lessened plant vitality are predisposing causes.

The last-mentioned cause is consequent upon the other two, and need not be dealt with in this place.

Nor is it within the scope of this pamphlet to enter fully upon the question of cultivation. It cannot, however, be too strongly pointed out that, without adequate preparation of the land, no artificial fertilisers can produce any effects. A deep and thorough preparation of the land is an absolutely essential preliminary to successful manuring, and in all that follows in reference to manuring the writer premises that such cultivation has been conscientiously executed.

Equally important and essential is the moisture supply. Without an adequate rainfall at the proper time or its equivalent, no manures can produce full effects upon the crop, and, indeed, the effects due to manuring are, other things being equal, commensurate within limits with the volume and regularity of the moisture supply.

Fortunately, in Queensland the climatic conditions are, on the whole, very favourable. Indeed, in the Northern and Mackay districts, where more than half of the sugar is produced, they are almost an optimum, the heaviest rainfalls being coincident with the highest temperatures.

In districts further south—as, for example, Bundaberg—the rainfall is inadequate for the production of full crops, but very great progress has been made there with the installation of machinery for irrigation, and where good cultivation is combined with irrigation, experience in other parts of the world has shown that the maximum returns are impossible without suitable manuring. Having now, in passing, called attention to the two essential preliminaries to the successful use of light manures or artificial fertilisers, let us now proceed to find out whether, upon the evidence already accumulated, it is reasonable to suppose that the production of sugar in Queensland could be increased by this means.

That Australia's yield of sugar per acre is, by comparison with yields obtained in other great sugar-producing countries of the world, exceedingly small, is abundantly proved by the statistics available. In Hawaii, for example, where the largest yields of sugar per acre are obtained, and where also the heaviest dressings of artificial fertilisers are applied, yields of from 70-80 tons of cane, yielding up to 10 tons sugar per acre, are by no means uncommon. In Egypt, also, 26-ton crops of cane, yielding $3\frac{3}{4}$ tons sugar, have been frequently obtained. The Queensland yields, by comparison with these figures, appear very insignificant. According to the annual report of the Department of Agriculture and Stock for the year 1905-06, the average yield or cane per acre for the years 1901-1905 has ranged from 10·86-16·04 tons, yielding from 1·3-1·78 tons of sugar per acre respectively. These figures show that the average yield of cane per acre in Queensland is actually less than the yield of sugar per acre in Hawaii. Clearly, then, there is immense room for improvement in the methods of the Queensland sugar-grower.

It is peculiarly unfortunate that the work accomplished by the Bureau of Sugar Experiment Stations in Queensland since its inception should have been largely nullified for the time, at any rate, by the unfortunate conditions which have been brought about through legislative enactments of the Commonwealth Parliament.

Dr. Maxwell's reports show beyond all question that the application of the methods of cultivation and manuring ordinarily practised in other sugar-growing countries will suffice for the production of equally good or even heavier crops in Queensland.

If the sugar industry in Queensland is to be carried on by highly paid white labour, bounty fed though it be, it will certainly never be by the production of such ridiculously small yields as above stated, but rather by a gradual change from an extensive to an intensive system of cane culture, by which means alone the cost of production can be kept at such a level as will secure a reasonable profit.

For the attainment of this object, the use of light manures is indispensable from whatever point the subject may be studied.

Attention has already been called to the gradual robbing of the soil which has been going on for many years throughout almost the whole of the sugar-growing belt. By reason, however, of the great extent of this belt, and the wide range of variation in climatic and soil conditions naturally met with therein, it will be convenient to deal with each district separately, and to collate for each the available date in reference to its fertiliser requirements, making then such recommendations as may be indicated by the evidence.

Following the classification adopted by Dr. Maxwell, the three main districts of Queensland will be taken in turn:—

(1.) Bundaberg District.

Already before the end of 1904 there had been collected from this district by the Bureau of Sugar Experiment Stations no less than 1,576 sub-samples of soils, representing typical sugar lands of Bundaberg proper, the Isis, Maryborough, Logan, and Moreton, and these had been subjected to chemical analysis.

Not only were the total quantities of lime, potash, phosphoric acid, and nitrogen estimated, but determinations were also made of the "available" quantities of lime, potash, and phosphoric acid by Dr. Maxwell's aspartic acid method.

It is impossible to here reproduce in detail the results arrived at, nor is it necessary. The official reports are available to all who are desirous of studying the question closely. The practical man does not want to be told the total amounts of the various manurial ingredients in his soil, nor the percentage of each which may be, at the time the soil sample is taken, in a form available for the use of the crop, but he is anxious to learn and eager to know exactly what manures may be relied upon to give the most profitable result. This the scientist is, unfortunately, not able to do with any degree of certainty until guided, not only by the results of chemical examination of the soil in question, but also in the light of knowledge gained from practical tests carried out in the field. It has been the aim of the Bureau of Sugar Experiment Stations to investigate the problem from both points of view. Reference to the tabulated reports will show that the soils of the Southern district present greater variations than those found in any other sugar district of Queensland. The total content of lime, for example, varies from ·168 per cent. at Gooburrum to 1·106 per cent. at Waterview, and is in nine out of nineteen cases more than ½ per cent. One noteworthy difference is presented between the level lands and the slopes of the Isis. On the slopes the lime has been reduced by leaching to ·294 per cent., while in the level lands it amounts to ·456 per cent. The nitrogen is also considerably less on the hillside than on the flat, and the potash is slightly less. The available potash shows also considerable variation, from as low as ·0099 per cent. up to ·0041 per cent., which, it may be mentioned, was found at Waterview Plantation, managed by the Millaquin Sugar Refinery.

For the Bundaberg district Dr. Maxwell says:—"Potash, nitrogen, and also some phosphoric acid are in immediate demand in order to bring the lands up

to their maximum producing capacity, which should be high in favourable climatic conditions."

The results of manurial tests in this district have, however, not been particularly satisfactory. In some instances no positive results have been obtained; in others, and particularly on the red soils, the manures have failed tions. Deep cultivation, on the other hand, has produced a very notable increase in crop. It must, however, be pointed out that manures have proved very profitable when applied to land which can be irrigated. There is no doubt that the first essential to the production of full crops in the Bundaberg or Southern district is the general adoption of more thorough cultivation than has been practised in the past. The way has now been paved for this, and it may be of interest to give the following plan of experiment, in accordance with which tests arranged by the writer are now in progress at four centres in the Bundaberg district:—

No. of Plot.	Kind of Manure.	Quantity per Acre
1...	Unmanured	...
2...	Superphosphate	2 cwt.
	Sulphate of ammonia	1 ,,
	Dried blood	1 ,,
3...	Superphosphate	2 ,,
	Sulphate of ammonia	1 ,,
	Dried blood	1 ,,
	Sulphate of potash	1½ ,,

These were only commenced last year, and it is still too early to look for definite results.

(2.) MACKAY DISTRICT.

The soils of the various localities comprising this district are, on the whole, fairly similar, being most fertile on the Burdekin Delta and least fertile in the Homebush and River Bank neighbourhoods.

In total content of lime the soils of the district are fair, and some are high, although the element is in an inactive state. In his report for the year 1901-2, Dr. Maxwell advises:—"Deep and very thorough cultivation and exposure of the largest possible mass of soil to the air and sun are the most effective means of bringing these large amounts of lime into an available state. In potash, nitrogen, and phosphoric acid the Mackay soils generally are very low. These elements must all be applied directly to the soil in order to produce paying crops."

It is interesting to give here the mean results from the Farleigh Estate, on which a manurial experiment has also been conducted:—

AVAILABLE ELEMENTS IN SOIL OF FARLEIGH ESTATE (Mean Results).

Lime	·1037	per cent.
Potash	·0276	,,
Phosphoric acid...	·0009	,,

This shows extreme lowness in phosphoric acid. The total phosphoric acid is, however, very much greater, so much so that, according to the figures of the analysis, only 5 parts in every 1,000 of the total could have been in an available form when the sample was taken. The available potash, ·0276 per cent., is equal to 828 lb. pure potash per acre in the surface soil, and yet, as will be seen immediately from the experiment results, a small addition of potash in the form of artificial fertiliser produced a very satisfactory increase of crop. The total nitrogen—namely, ·123 per cent.—is satisfactory, and yet, judging from the results of the manurial test, this ingredient was also deficient. The total lime content is high—namely, ·910 per cent.

An experiment was commenced in the season 1905-06 on the Farleigh Estate, under the supervision of Mr. J. C. Penny. The plan of experiment was as follows:—

No. of Plot.	Kind of Manure.	Quantity per Acre.
1...	Unmanured	...
2...	Sulphate of potash ... ... Superphosphate	2 cwt. 3 ,,
3...	Sulphate of potash ... ... Sulphate of ammonia	2 ,, 1½ ,,
4...	Superphosphate ... ... Sulphate of ammonia	3 ,, 1½ ,,
5...	Sulphate of potash ... ... Superphosphate ... ... Sulphate of ammonia	2 ,, 3 ,, 1½ ,,

This experiment was conducted on a poor black soil, at an elevation of about 100 feet above sea level. The average annual rainfall is about 70 inches. The land had been under sugar-cane before the present owners bought the estate, but had not grown any crop for five years previous to the commencement of the experiment. The land slopes slightly, and has a clay subsoil, which occurs 12 inches beneath the surface. The cane in the experiment under review was planted 24th July, 1905, and harvested 28th August, 1906. The experiment field was laid off in such a way that four rows of unmanured cane separated every two plots. The ground could not have been quite uniform in character, because the yields from the unmanured plots increase gradually from 1-5, the average yield from five unmanured plots being 14 tons 7 cwt.

The results of the experiment were as follow:—

No. of Plot.	Yield per Acre.	Cost of Manure per Acre.	Value of Increase.	Profit or Loss.
	Tons cwt. qr.	£ s. d.	£ s. d.	£ s. d.
1	14 7 0	...	...	...
2	12 18 3	2 0 6	1 1 2 (loss)	3 1 8 (loss)
3	20 10 0	2 7 3	4 12 3	2 5 0
4	19 6 1	1 13 9	3 14 5	2 0 8
5	23 0 0	3 0 9	6 9 9	3 9 0

Note.—The value of the increase is calculated at the rate of 15s. per ton, which is exclusive of the bonus for white-grown cane, and, as this bonus is usually regarded as sufficient to defray the cost of cutting, no allowance has been made for the extra cost involved in cutting the heavier crop from the manured plots. All other charges—as, for example, rent and costs of preparing the land and cultivating the crop—are the same for the manured as for the unmanured land.

It will be seen that a complete manure—that is, a manure containing potash, phosphoric acid, and nitrogen—has given the most profitable crop; that a mixture of potash and nitrogen came next in order, showing that those two ingredients were most wanted by the crop, while, strange to say, a mixture containing potash and phosphoric acid only failed to give a profit, and this despite the fact that chemical analysis had shown the soils of the district to be, as a rule, deficient in available phosphoric acid. This result is one additional proof that chemical analysis alone does not afford a true indication of the manurial requirements of any soil, but that the analysis must be supplemented by practical field tests before recommendations as to manurial treatment can be made with any degree of certainty.

At the Mackay Sugar Experiment Station elaborate experiments, designed with a view to determine the relative value of ordinary cultivation, deep subsoil cultivation combined with irrigation, in each case both without manure and with mixed fertilisers, have been carried out.

In addition to these tests, experiments have also been carried out in which the manurial ingredients were applied singly to various plots, and the crop compared with an unfertilised crop alongside. The results of these experiments are shown in the following tables taken from the Annual Report of the Bureau of Sugar Experiment Stations for the year 1903:—

TABLE I.

ACTION OF THE ELEMENTS ON NON-IRRIGATED CANE.

Fertilising Elements.	Weight of Cane per Acre.	Sugar in Cane.	Total Sugar per Acre.
	Tons.	Per cent.	Lb.
(1) Nitrogen	51·5	13·60	15,689
(2) Potash	51·5	13·50	15,574
(3) Lime	50·5	13·50	14,762
(4) Phosphoric acid	48·9	13·90	15,225
(5) No fertiliser	48·3	13·70	14,822

TABLE II.

VALUE AND COST OF THE CROP (Grown with Single Fertilising Elements).

(1) Deep, Subsoil Cultivation, Non-Irrigated.

Fertilising Elements.	Value of Crop per Acre.	Cost of Crop per Acre.	Profit per Acre.
	£ s. d.	£ s. d.	£ s. d.
(1) Nitrogen	50 12 10	24 18 0	25 14 10
(2) Potash	50 12 10	24 16 0	25 16 10
(3) Lime	49 13 2	24 2 8	25 10 4
(4) Phosphoric acid	48 1 9	23 5 6	24 16 3
(5) No fertiliser	47 10 5	22 12 0	24 18 5

(2) Irrigated, Deep, Subsoil Cultivation.

Fertilising Elements.	Value of Crop per Acre.	Cost of Crop per Acre.	Profit per Acre.
	£ s. d.	£ s. d.	£ s. d.
(1) Nitrogen	48 1 8	29 0 11	19 0 9
(2) Potash	48 13 6	29 1 3	19 12 3
(3) Lime	45 18 5	27 1 3	18 17 2
(4) Phosphoric acid	42 9 8	26 3 3	16 6 5
(5) No fertiliser	39 16 6	25 3 9	14 12 9

In the "non-irrigated" experiments it is seen that the elements "nitrogen," "potash," and "lime" gave small profits of 16s. 5d., 18s. 5d., and 11s. 11d. respectively per acre, while the "phosphoric acid" made a loss of 2s. 2d. per acre.

In the "irrigated" series, nitrogen gave a profit of £4 8s.; potash, of £4 19s. 6d.; lime, of £4 4s. 5d.; and phosphoric acid, of £1 13s. 8d. per acre. Phosphoric acid as phosphate is associated with lime, and often with small amounts of nitrogen, which elements also affect the results.

As will be seen from these figures, potash and nitrogen produced the same relative increase in the weight of cane per acre (*see* Table I.), although the nitrogen-grown cane was richer in sugar by one-tenth per cent. The lightest increase was produced by phosphoric acid, but in this case the cane was richest in sugar, so that the total sugar per acre is only some 300 lb. less than on the potash plot.

(3.) CAIRNS OR NORTHERN DISTRICT.

In his explanatory notes upon the tabulated results of the chemical examination of soil samples from this district, Dr. Maxwell says:—"These data

Plate XXII.

Results of Manurial Experiments at Mossman.

make it unmistakable that the soils of the Northern district are uniformly low in available proportions of the vital elements (lime, potash, phosphoric acid, and nitrogen). As far as the analyses have proceeded it is also indicated that the total amounts of those elements are also low in most of the sub-districts. This, however, is not without exception. In the Mossman sub-district the total amounts of potash are found to be high, although very unavailable. These comments are absolutely confirmed by the more complete data that have been furnished, and which are expressed summarily in the table given. Excepting the Herbert River localities, the "total amounts" of lime are below the established minimum of 0·3 per cent. Excepting the Mossman and Cairns localities, the "total" potash is below the minimum. In all the localities "total amounts" of nitrogen, also of phosphoric acid, are extremely low, while the "available amounts" of all the elements are far below the minimum in the localities of the whole district.

Further, in a previous report Dr. Maxwell said, "Lime, potash, nitrogen, and some phosphoric acid are shown to be urgently demanded by most of the soils of this district. In the sub-district of the Mossman some small areas are fairly good in lime, also throughout the Mossman localities the potash is above the average, but very thorough treatment of the soil by cultivation and liming is required to bring that element within reach of the growing crop."

As showing how low the soils of the Cairns district are in amounts of available manurial ingredients, the following table is reproduced in full from the Annual Report of the Bureau of Sugar Experiment Stations for the year 1903-4:—

CAIRNS OR NORTHERN DISTRICT.

Subdistricts.	Amounts of Elements Available.			Total Amount of Nitrogen.
	Lime.	Potash.	Phosphoric Acid.	
	Per cent.	Per cent.	Per cent.	Per cent.
Mossman	·0659	·0137	·0009	·128
Kamerunga	·0430	·0082	·0014	·092
Hambledon	·0678	·0108	·0013	·122
Mulgrave	·0996	·0148	·0011	·120
Geraldton	·0365	·0149	·0005	·167
Mourilyan	·0311	·0137	·0006	·166
Halifax	·1035	·0138	·0012	·117
Ingham	·0508	·0121	·0010	·095
Ripple Creek	·0908	·0171	·0009	·104
Means	·0654	·0132	·0010	·122

This table of analyses represents soils taken from 752 places.

The indications for manurial treatment which may be deduced from the foregoing table have been amply confirmed by the results of an experiment carried out in the Mossman district. Photographs showing the growing cane on the plots of this experiment, and also specimens of the cane removed for exhibition purposes, are here reproduced. This experiment was conducted under the supervision of Mr. W. F. Seymour Howe, Chemist in Charge at the Mossman Central Mill.

The manurial dressings applied consisted of meatworks fertiliser and sulphate of potash, analysing—

12·3 per cent. phosphate of lime = 5·2 per cent. insoluble phosphoric acid;
9·0 per cent. nitrogen;
11·1 per cent. pure potash.

900 lb. of this mixture were applied in two equal dressings of 450 lb. per acre, the first being given when the cane was a little over 12 inches high, and the second just before leaving off cultivation. The cost of this manuring, including application, amounted to £4 10s. per acre.

In reference to this experiment, the following extract from a letter written by Mr. Howe to the author, under date 6th August, 1906, is of special interest:—"... . The stools forwarded were true average stools from $\frac{1}{4}$-acre blocks, unmanured and manured. The cane is the 'Goru' variety, a New Guinea cane, which is giving satisfactory results, both from a milling and farmer's point of view, throughout North Queensland. Both stools are of the same age—viz., nine months—and had the same cultivation precisely, with the exception of manuring. Of course, it is needless for me to point out the differences, which should be very apparent to the professional or lay mind. My experimental work in the matter of manuring has been very successful, both in the nursery and different estates, which is borne out by the increased demand for manure in this district. The value of manure applied for this year is £10,000, as against £3,000 last year. After four years' experimenting in this district, I now recommend the following system of manuring to the farmers:—

"A dressing of 4 cwt. per acre meatworks fertiliser in the drill when planting. When the plant is about 12 inches high a top-dressing of the mixture of which I have already given the analyses; finally, before leaving off cultivation, a similar top-dressing of the same mixture. The mixture seems to be admirably adapted to the requirements of this district, and the results of same fully bear this out. You will note the striking difference in the photograph of 'Goru' cane manured with and without potash, and the splendid appearance of the manured cane as against that of the unmanured, both of the same age.

"I may state that I prefer the potash in the form of sulphate for the reason that the depletion of lime from the soil due to our heavy rainfall is less than when muriate is used. . . . ."

Further comment on the results of this experiment is almost superfluous. The only point to which the writer would call special attention is that this result was obtained on a soil which, according to the analysis of the Bureau of Sugar Experiment Stations, contains more potash than the general run of soils used for cane-growing in North Queensland.

In addition to the tests described above, experiments have been arranged and carried out by the Sugar Bureau acting in co-operation with prominent growers throughout the various districts of the State. The results of these experiments, so far as they have yet been published, go to show, with few exceptions, in which sufficient reasons can usually be assigned for the cause of failure, that deep, thorough cultivation, supplemented by adequate supplies of artificial fertilisers containing lime, potash, phosphoric acid, and nitrogen, are, as a rule, sufficient to very considerably increase the yield above the average obtained in any given district.

To quote only one of these examples, reference may be permitted to a test carried out in the year 1902-3 by Messrs. Anderson Bros. at Halifax, where the yield was raised from 25-31 tons by thorough cultivation alone; this was further increased to $35\frac{3}{4}$ tons by a mixture of complete manures, and still further increased to $42\frac{1}{2}$ tons cane per acre when lime was given in addition to the potash, phosphoric acid, and nitrogen of the mixture. And so on examples might be multiplied.

Enough has, however, been said to show clearly the great value of light manures as a factor in Australia's sugar production.

Light manures are in themselves insufficient to produce greatly increased yields, and no grower need follow the old methods of cultivation and expect an adequate return for money expended on artificial fertilisers. But that with deep and thorough cultivation, with due attention to the supply of moisture, to the drainage, to the lime content of the soil, and, finally, to the selection of suitable varieties of cane, the increased returns which may be brought about by the use of artificial fertilisers are a very handsome profit upon the outlay has been amply proved.

Plate XXIII.

Cane Grown with and without Manure at Mossman.

AVERAGE COMPOSITION OF CHIEF FERTILISER MATERIALS ON THE AUSTRALASIAN MARKET.

Name.	Percentage of Pure Potash.	Percentage of Phosphoric Acid. Water-Soluble.	Percentage of Phosphoric Acid. Citrate-Soluble.	Percentage of Phosphoric Acid. Total.	Percentage of Nitrogen.
(A)—Potassic Manures—					
Muriate of potash, 80 per cent. purity ...	50·0	...	...	...	...
Muriate of potash, 95 per cent. purity ...	60·0	...	...	...	...
Potash manure salt	30·0	...	...	...	...
Kainit	12·4	...	...	...	...
Sulphate of potash, 90 per cent. purity ...	48·5	...	...	...	...
Sulphate of potash, 96 per cent. purity ...	52·0	...	...	...	...
(B)—Phosphatic Manures—					
Superphosphate	...	17·0	...	17·0	...
Superphosphate	...	20·0	...	20·0	...
Malden Island guano	...	...	...	29·0	...
Surprise Island guano	...	...	...	19·0	...
Thomas phosphate	...	...	13·0	17·0	...
Ocean Island phosphate	...	...	...	39·0	...
Christmas Island phosphate	...	...	...	39·0	...
(C)—Phosphatic and Nitrogenous—					
Bone meal (high grade)	...	...	...	20·0	5·0
Bone dust	...	...	...	20·0	3·0
Bone char	...	...	...	30·0	0·75
Bone and blood	...	...	...	14·3	7·5
Peruvian guano	...	11·75	...	11·75	5·75
Nitro-superphosphate	...	9·25	...	18·0	1·25
(D)—Nitrogenous—					
Nitrate of soda	...	...	...	...	15·0
Sulphate of ammonia	...	...	...	...	20·0
Blood manure (high grade)	...	...	...	...	13·0
Blood manure (low grade)	...	...	...	...	9·25

AVERAGE COMPOSITION OF THE MOST IMPORTANT FARM MANURES.

Name.	Potash (K_2O).	Phosphoric Acid (P_2O_5).	Nitrogen (N).
Cow manure (fresh)	0·40	0·16	0·34
Horse manure (fresh)	0·53	0·28	0·58
Sheep manure (fresh)	0·67	0·23	0·83
Pig manure (fresh)	0·60	0·19	0·45
Fowl manure (fresh)	0·85	1·54	1·63
Mixed farmyard manure	0·63	0·26	0·50

TABLE, GIVING THE AMOUNTS OF FERTILISER INGREDIENTS (POTASH, PHOSPHORIC ACID, AND NITROGEN) CONTAINED IN THE CROP FROM ONE ACRE.

Crop.	Yield.	Straw, &c.	Potash.	Phosphoric Acid.	Nitrogen.
			Lb.	Lb.	Lb.
Apples...	15 tons	...	60	30	39
Barley	30 bush.	2,000 lb.	51	17	57
Beans	30 bush.	2,700 ,,	53	30	75
Cabbage	30 tons	...	270	70	200
Maize	70 bush.	6,000 ,,	55	48	83
Grapes...	2 tons	7,000 ,,	39	11	32
Hops	600 lb.	2,700 ,,	53	23	84
Mixed hay	..	5,000 ,,	77	18	70
Ooats	60 bush.	3,200 ,,	62	22	55
Onions...	10 tons	...	36	18	36
Pears	16 tons	...	26	10	32
Peas	30 bush.	3,000 ,,	52	33	108
Plums	8 tons	...	40	4	30
Potatoes	6 tons	1,500 ,,	76	21	46
Timothy hay	...	4,000 ,,	94	23	89
Tobacco	1,600 lb.	1,400 ,,	200	16	76
Tomatoes	10 tons	...	54	20	32
Turnips	15 tons	5 tons	148	33	110
Wheat	35 bush.	3,000 lb.	31	24	95

TAPIOCA MANUFACTURE.

Tapioca is the product of the manihot or cassava plant, which thrives so luxuriantly in North and even in Southern Queensland. The plant requires very little attention. The cuttings of the stems are placed in the ground, and they will make a gallant and successful fight for life in conflict with weeds, drought, and neglect, and produce a good crop of tubers. Of course, all plants yield better crops by proper cultivation. With ordinary slipshod culture the yield of tubers may be doubled, and high-class cultivation will result in three to four fold returns. Not the least attractive feature about this crop is that the poorest farmer can compete on nearly equal terms with well-equipped modern plants—not, perhaps, in the production of the higher-priced fancy "flake" and "pearl" tapioca, which require special appliances to turn out, but in making of the flour by a process indeed most simple.

While the crop of tubers is maturing, the farmer digs one or more shallow wells, preferably in low places of poor drainage and where the water will become stagnant.

As soon as the tubers are mature, they are dug, and a well or hole is charged with them, care being taken to see that they are completely submerged. Here they are left till so far decomposed that the tubers are easily mashed in the hand. This process takes from four to seven days, according to the heat and foulness of the water. The rotting tubers are now withdrawn, and the well immediately recharged with fresh ones.

The first lots are placed in a large tub and trodden down by foot into a fine pulp. A bejuco basket, of about $\frac{1}{4}$-inch mesh, is now placed in another tub, and into this the pulp is poured; water is occasionally added, and in a short time all except the wood fibre and skins is strained through. The basket is recharged with pulp until the desired quantity has been used, when the basket is withdrawn, and the pulp left for twenty-four hours to precipitate. When this has settled, the water and some fibrous matter remaining on top of the flour is skimmed off.

The mass is now taken out and thrown into gunny sacks tied to sticks driven in the ground in triangular position, and left there to drain until the mass is solid enough to lift in cakes from the sacks. It is then broken up and spread upon a cement floor to dry. As it dries, the lumps are broken down still more finely, and, when completely dry, is trodden down until fine enough to be passed through fine bamboo sieves, when it is packed and ready for market.

By this method practically all of the flour is removed, the poorest results yielding, by weight, 27 per cent. of the tuber up to a maximum of 32 per cent. where decomposition has been complete and all the processes so conducted as to avoid waste. As the best samples of manihot rarely indicate by laboratory tests more than 32 to 35 per cent. of actual starch contents, these factory operations leave little to be desired.

With the recognised alimentary value of tapioca products and their ever-increasing use, there is hardly room to doubt that, with an assured and dependable supply of tubers, factories for the production of the finer grades of tapioca would quickly spring up in our midst.

The above is taken from the publication of the Publicity Committee, Manila Merchants' Association.

CARAVONICA COTTON.

The "Morning Post," Cairns, of 19th August, publishes the following letter from Dr. Thomatis, the producer of the now world-famous Caravonica cotton:—

"Sir,—By last European mail I received surprising news, written just a week before the sale of my cotton by my agents in Havre (France), Messrs. A.

and E. Fossat. My bales were shipped, as you know, on the 30th April, from Cairns, on the German-Australian Company's boat, the 'Flensburg,' for Marseilles, as the steamer was not to call at Havre.

"My agents did not like to get the bales by train from Marseilles to Havre, as they wished to get them by coastal steamer, so that there should be a record in the Havre shipping trade. The directory of the German-Australian Company came to hear of this, and at once from the head office at Hamburg telegraphed to their office in Marseilles to order the 'Flensburg' to keep the Caravonica cotton on board, and to call specially at Havre to deliver it at the wharf without extra charge. At the same time the directors also telegraphed to the Messrs. Fossat, Havre, informing them of the arrangements. The s.s. 'Flensburg' steamed into Marseilles just six hours after the above arrangements were made by telegraph from Hamburg.

"On the 'Flensburg' entering Havre Harbour the additional Australian flag was hoisted with a streamer bearing the word 'Caravonica.' The result of the sale has been cabled to me, and it is known—viz., 156 francs per 50 kilo (1 cwt.), or 15d. per lb.—while American cotton was sold at 5d.!"

There are three varieties of the Caravonica—silk, wool, and alpaca. For a bale of each of them Dr. Thomatis received respectively per lb. 17d., 16d., and 15d. We are pleased to hear of Dr. Thomatis's success with the cotton, a success which he well deserves for the persistency with which he has kept the virtues of his cotton before the world.

In connection with this subject, a gentleman who is cotton-growing in the Solomon Islands, said it was well-named tree-cotton. It grows to an enormous height there, and spreads its branches 8 or 9 feet from the stem. Although planted 10 feet apart, the plants form a dense jungle, so much so that half the crop cannot be picked. Already some 30,000 lb. have been picked, and as much more remains on the bushes. The yield is estimated, if all could be gathered, at over 2,000 lb. of seed cotton per acre.

COTTON AND ITS BY-PRODUCTS.

It was left, it is claimed, to the Americans to teach the world the enormous value of by-products; and to a certain Chicago packing-house to prove that every part of an animal could be converted into cash—except its squeal, though it was not "good business" that there should be any waste at all. In almost every useful field of knowledge the Americans have had something sensible to say, and their last essay is on the comparative value of whole cotton seed and cotton-seed meal in fertilising cotton (Farmers' Bulletin No. 286), published by the United States Department of Agriculture, Washington. In years gone by, cotton was simply grown for the value of its fibre. The seed was regarded as a nuisance to be got rid of by dumping it into the nearest river or in any other convenient way. To-day the seed represents a large proportion of the value of the cotton crop—so large, in fact, that it is estimated that the seed yield of a 12,000,000-bale crop is worth the respectable sum of *Rs. 30,00,00,000 in the raw state. First of all, the fertilising value of the seed was recognised, and for a considerable period of years it was solely used for planting and fertilising purposes. Next, it was discovered that the oil it contained was of great use in a variety of ways; and the demand for it is such that the value of the oil in an ordinary American crop of seed has advanced from zero to Rs. 18,00,00,000.

A problem that has sometimes faced the American planter has been whether it would pay him better to use his seed as a manure or sell it for its oil value, purchasing some other fertiliser with the proceeds. The United States Agricultural Department has solved this problem in an eminently satisfactory manner by proving by a series of experiments that, so far as can be

* 1 Rupee = 1s. 4d. sterling.

ascertained at present, the oil contains none of the ingredients which give to the seed its fertilising value. The oil is composed of carbon, hydrogen, and oxygen, three elements which are essential to plant growth, but which are supplied so abundantly by Nature that it is unnecessary to apply them artificially; hence the fertilising value of the seed is not diminished by extracting the oil, and the planter is furnished with another by-product of great value to him, and a substantial sum annually will be added to the wealth of the country. For instance, statistics show that, of the American crop of 1905, 61·9 per cent. of the quantity of seed produced was crushed, and about 7 per cent. was required for planting, leaving 31·1 per cent. unaccounted for, but which was probably utilised by the growers for fertilisation in the form of seed. Now, the crop of that year produced nearly 6,000,000 tons of seed, of which about 1,800,000 tons were applied to the land as a fertiliser. This 1,800,000 tons contained about 72,000,000 gallons of oil worth about Rs. 5,40,00,000, which huge sum, it now appears, was absolutely wasted.

The American planter, like his confrères in other climes, is often conservative, and is seldom in a hurry to leave the beaten track that was popular when the knowledge of cotton culture was vaguer than it is now; and it was to prove to him beyond all doubt that the value of cotton seed was not adversely affected by the extraction of the oil that the experiments in question were undertaken. These experiments were conducted with raw cotton seed and cotton-seed meal—cotton seed from which the oil had been expressed. There is, of coure, an important difference in both the condition and chemical composition of seed and meal. The seeds, for instance, are encased in hulls, which must decay before the crop can utilise the plant food in them; and the kernels contain oil, which is supposed to retard their decomposition, so that considerable moisture is required to decompose the seed and make it available for plant food. In a very dry season it may well happen that it does not become available fast enough to supply the crop, and it may be a portion of it fails to become available until after the crop has matured. On the other hand, the fertilising value in meal, being in a finely pulverised condition, is more likely to become available during a dry season than in seed; but, when there is excessive rainfall, it is liable to become available so fast that the crop cannot utilise it, and a portion of it will likely be wasted. It would seem, therefore, that seed has an advantage over meal in wet seasons, but the reverse proved to be the case.

The experiments were carried out in 1905 and 1906, on 1-acre plots of a dark sandy loam with a clay subsoil, quite representative of a large percentage of the American cotton soils requiring artificial fertilisers. Forty bushels of seed to the acre were tested in comparison with 600 lb. of meal, and 30 and 20 bushels were compared with corresponding quantities of meal, the quantities of seed tested being those most commonly used by growers in general practice. It was decided that the necessary quantities of acid phosphate and kainit or potash to make a properly balanced fertiliser should be added to the seed in each case. There was some difficulty in determining how much meal should be tested in comparison with the various quantities of seed, but this was bridged by estimating what quantity was necessary to make a properly balanced fertiliser with the same amount of acid phosphate and kainit or potash that was employed on the corresponding plots of experimental land on which whole cotton seed was used as a fertiliser.

In the first experiment two plots of 1 acre each were used. The first was treated with 600 lb. of meal, 768 lb. of acid phosphate, and 50 lb. of muriate of potash. The second plot was manured with 40 bushels of whole seed, the quantities of the other fertilisers being the same in both cases. The result showed a difference of about Rs. 40 per acre in favour of using 600 lb. of meal instead of 40 bushels of seed. In the second experiment the first plot was treated with 450 lb. of meal, 576 lb. of acid phosphate, and 148 lb. of kainit; and the second plot with 30 bushels of seed, the quantities of the other fertilisers

being the same. In this test there was a difference of about Rs. 36-8 in favour of using 450 lb. of meal per acre instead of 30 bushels of seed. In the third case, one plot was covered with 300 lb. of meal, 384 lb. of acid phosphate, and 25 lb. of muriate of potash; and the second with 20 bushels of seed, the quantities of the other fertilisers being again equal in both cases. There was here a difference of Rs. 23-4 in favour of using 300 lb. of meal instead of 20 bushels of seed. It is urged that the results amply justify the assumption that 900 lb. of meal are at least equivalent to a ton of seed in effect on a crop.

These experiments are of more than passing interest to India, where cotton cultivation is very much to the fore; and they might be repeated with advantage in several parts of the country, and the results carefully noted. There is just one other point that is deserving of special attention, and that is the best method of preserving cotton seed, the value of the oil depending upon the condition of the seed when it reaches the crushing-mill. Th common practice seems to be to pile the seed as the cotton is ginned, but it becomes very hot in such piles, and is ruined for oil-mill purposes. The method recommended is to spread the seed in thin layers over as large a surface as possible, thus keeping it in prime condition for all purposes.—"Indian Trade Journal."

COTTON-GROWING IN AUSTRALIA.

The following article (from the "Times Financial and Commercial Supplement") on cotton-growing in Australia has been received by the Minister for Agriculture from the Agent-General's Office in London. The writer appears to assume that cotton-growing in Queensland was a failure in past years, and that when the industry revived during the American Civil War it was only in an experimental stage and merely kept alive by the bonus. The export of 8,000,000 lb. of lint certainly disposes of the experimental idea, and as to the bonus it was not the discontinuance of the bonus which caused farmers to give up cotton-growing, but the great fall in price at the conclusion of the war. Again, the writer says that the prohibition of cheap coloured labour in the Commonwealth must seriously affect the question of restarting the industry. It seems hopeless to convince the British newspaper man that coloured labour was never employed by farmers in the cultivation of cotton. Kanakas were tried on one plantation certainly, but it was soon found that cotton could be more profitably grown in small areas by white men than on big plantations with coloured labour; hence all the cotton grown in Queensland during and long after the Civil War was produced by white farmers and their families. And such is the case now. The industry is rapidly reviving. Farmers last season made from £8 to £15 per acre from their cotton plots, and at the same time carried on their dairying, sugar-growing, and general farming. Cotton has come to stay in Queensland. A further inducement to extend the industry is the bounty of 10 per cent. on all cotton exported from the State. This at once adds from 15s. to 25s. per acre to the value of the crop. It cannot be too strongly emphasised that coloured labour is not wanted in Queensland for cotton-growing. Even if kanakas were available, they are very nearly as expensive and not nearly so useful as good, steady white labourers, and the farmers would certainly not think of employing coloured labour, at all events in the Southern and Central districts of the State:—

Cotton-growing in the Northern Territory.

The Northern Territory of Australia consists of 335,116,800 acres, and has a coastal frontage of 1,200 miles to the Indian Ocean, and in the immediate neighbourhood of Port Darwin, which is inhabited principally by Chinese, sugar-cane, cinnamon, ramie or vegetable silk, hemp, cocoanuts, rubber, and many other plants of economic value are successfully cultivated. The population is small in the extreme, containing only 900 whites and 2,700 Chinese,

in addition to the aboriginal population. There can be no doubt that the climate and a large portion of the soil are eminently suitable for cotton culture—so much so, that cotton has disseminated itself without the help of man, and may almost be considered as part of the North Australian flora, and is found for nearly 400 miles inland. The fact that of the eight species of gossypium or cotton seven varieties are found in the Northern Territory, while two occur only in Queensland, South Australia, and Western Australia, and one only in New South Wales, shows conclusively that the Northern Territory is the natural home of the cotton plant.

FAVOURABLE HARVEST WEATHER.

The harvest of the ripe product falls almost wholly in the dry season, and the picking is but little interrupted by rain, which in America not infrequently spoils a considerable part of the crop; the pods are ready for picking in May, June, and July, when the weather is dry and comparatively cool, and this operation is rarely interfered with by wet weather, and then only by a passing shower. The contrast in this respect is greatly in favour of Australia as compared with other cotton-producing countries. There can be no doubt that cotton can be grown by white labour on the uplands of the territory, some distance away from the seaboard, but the unskilled labour is not at all cheap, as the Chinese demand and obtain from 5s. to 7s. per day. On the coast lands, however, where the Sea Island variety grows to perfection, it is absolutely impossible to cultivate it with white labour; the tropical swamps would speedily ruin the constitutions of Europeans.

NEED FOR SCIENTIFIC STUDY.

The successful establishment of cotton cultivation in the Northern Territory at the present time will depend to a large extent on the prevailing economic conditions as well as on the possibility of cultivating other and more profitable crops than cotton, and on the supply of labour and the facilities of transport. No less important than these to the successful and permanent establishment of the industry will be the necessity for continual activity in scientific investigations and in the collection of information as to the progress being made in foreign countries in cotton cultivation, and to the needs of manufacturers for various varieties of cotton. The actual cultivation of cotton is an agricultural problem requiring for its solution chemical and botanical knowledge in addition to practical experience. The present permanent position of the United States of America in cotton cultivation is largely due to the operations of its well-organised and splendidly-equipped experiment stations of the Department of Agriculture, which are continually engaged in scientific investigations into the innumerable problems which arise and in the collection and dissemination of information. I strongly recommended to the South Australian Government the establishment at Port Darwin of an experiment station and a seed farm, where agricultural experiments in cotton cultivation may be carried on, and where selected seed may be grown for distribution to growers.

CULTIVATION OF NATIVE VARIETIES.

Whilst at Port Darwin I was shown an indigenous cotton by the Curator of the Botanic Gardens, yielding, even in its wild or semi-cultivated state, fibre of a fairly good quality, which, by careful selection and cultivation, could doubtless be greatly improved. In this cultivation and improvement of native varieties there probably lies, as a rule, a far better chance of success than in the introduction of foreign forms, although in most countries American and Egyptian varieties have been experimentally grown with some success. These experiments, however, have not been on a scale large enough to prove whether these varieties can be successfully acclimatised, although there is sufficient information to show that exotic cottons can be successfully cultivated. The Sea Island variety grown

at Palmerston clearly demonstrates that this long-staple cotton can be grown to perfection on the coast lands of the Northern Territory. The Bounties Bill, the object of which is to assist growers engaged in tropical industries, will be reintroduced in the Federal Parliament during the ensuing session, and it is hoped with cheap lands and bonuses to encourage the settlement of a white population. It is not too much to say that the problems to be solved there require the exercise of the highest statesmanship.

Growth of the Industry.

Many years ago several attempts were made to establish cotton-growing in Queensland, but after a trial lasting for some years the industry was abandoned, and at the time of my arrival it was non-existent. Although cotton had been grown in the early history of that State, it was not until the time of the American Civil War that the industry became important. In 1862, 14,344 lb. of cotton were exported at an average value of 1s. 11d. per lb., and from that time up to 1871 8,000,000 lb. were exported. A large bonus granted by the Government on every bale of cotton exported helped to stimulate the industry. Later on it was decided to abolish the subsidy, and very soon cotton ceased to be cultivated. Then the idea of manufacturing their own cotton fabrics in the State came to the front, and led to the second period of cotton-growing. The Queensland Parliament sanctioned the payment of a large sum of money to the first factory which turned out a quantity of cotton manufactured goods. With this inducement a company was formed, and a factory erected at Ipswich, and thus, with the prospect of a market at their doors, the farmers of West Moreton were induced once more to include cotton amongst their other crops.

Difficulties Encountered.

This revival was, however, short-lived, lasting from 1890 to 1897, when financial difficulties brought the operations of the cotton manufacturing company to an end, and by this misfortune cotton-growing was stopped for a second time. It was proved, however, that cotton could be grown, and experience was gained as to the soils to be selected. Errors were made in planting on rich alluvial ground, where the plant grew vigorously, producing wood rather than cotton fibre. One difficulty attaching to the cotton-growing industry is the amount of labour demanded in the picking season, and, although the work is light, it requires an outlay of much time, and thus renders the crop only profitable when cheap labour is available for the purpose. Hence the Federal laws, which prevent the introduction of cheap coloured labour into the Commonwealth, seriously affect the question of restarting the industry; but hopes are entertained that cotton may be grown in districts where the white farmer can cultivate it on small holdings capable of being managed by a white family, with occasional hired labour. There can be no doubt that owing to the superior quality of the fibre (and it is generally acknowledged that Queensland cotton is worth 1d. per lb. more than American cotton), and also to the superior intelligence in field work of the white cultivator as compared with the black labourer, it can for these reasons be cultivated profitably as an adjunct to other crops. It cannot, however, be grown in large plantations in the absence of cheap coloured labour. The Queensland farmer is quite aware that to cultivate cotton successfully it is necessary to receive some protection from the coloured labour of tropical countries. If tropical Australia is to enter into competition with other countries in the production of cotton, the conditions must be equalised as regards labour, or the grower must receive a substantial measure of protection either in the form of a bonus or the guaranteeing of a *minimum* price.

Fiji Cotton.

Probably no country in the world can grow cotton to better advantage than the Fiji Islands. Formerly, about thirty years ago, cotton was the chief export of these islands; but owing to low prices the industry was abandoned,

the cultivation of sugar-cane being far more profitable to the planters. Undoubtedly the Sea Island variety is best adapted for these islands; but when I paid my visit, at the invitation of the Government, there were not more than 3 or 4 acres in actual cultivation. Cotton has been superseded by sugar-cane; but nevertheless great interest was taken in my efforts to revive the industry, and the Government fully recognised the importance of re-establishing it, and experimental stations in cotton cultivation have been inaugurated in different parts of the islands. But, whilst the Fiji cotton is of excellent quality of long staple, it is very irregular. Uniformity in length of fibre is a feature of primary importance, and the long-stapled cottons of Fiji and Queensland are capable of much improvement. This is one of the qualities considered by Sea Island planters everywhere in making their selections. Whilst the majority of the fibres range in length between 1½ inch and 1¾ inch, the fibres near the point of the seed are frequently much shorter than those on the base and middle, and, again, some of the middle fibres were very long, reaching a length of 2½ inches to 3 inches. This lack of uniformity could doubtless be corrected by a few years of careful selection. In selecting to secure uniformity, it is not enough to judge simply by the regularity of all the fibres of the same seed. Seeds from different bolls from different parts of the plant must be examined to see that the fibres on the different seeds are of the same length, or nearly so. If long-staple cotton is variable in length of fibre, there is considerable waste in the process of manufacture, and the value of the staple is impaired.

COTTON-GROWING IN NEW SOUTH WALES.

A correspondent of the "Sydney Mail," who wishes to start cotton-growing in New South Wales, asked the following questions, which were forwarded to us for replies. Mr. D. Jones, to whom they were referred, furnished the replies appended, which we publish, as they may be of great use to intending growers in Queensland:—

Question 1.—What is generally considered the best variety of cotton for sale?

Answer.—The best varieties are Uplands, Russell's Big Boll, Sea Island, Seabrook variety. In North Queensland the Caravonica type is preferred.

The Uplands yields from 1,000 to 1,600 lb. per acre; Sea Island, from 1,000 to 1,200 lb. The value in the seed is 1½d. per lb. for Uplands and 2¼d. for Sea Island, according to quality.

Question 2.—Is there any market in New South Wales or anywhere in Australia for cotton?

Answer.—There is a large demand for Upland cotton for spinning purposes in all the States. Messrs. Kitchen and Sons, Limited, Brisbane, Sydney, or Melbourne, are cash buyers of cotton in the seed.

Question 3.—What was the average price obtained last season in Australia or for Australian-grown cotton in the market it was mostly sold in?

Answer.—The price paid for Upland cotton was 1½d. per lb. last season (on rail). Sea Island brought 2¼d. per lb.; Caravonica, 2d., all in the seed.

Question 4.—What machinery is used in ginning cotton? Is it expensive? Can it be procured in Sydney?

Answer.—Saw-gins or roller-gins are used for separating the fibre from the seed, and linters for further removing the short fibre remaining on the seed after ginning. Gins cost from £30 to £70; linters, £120; presses, from £40 upwards; motive power, from £150 upwards. There is no machinery suitable for cotton-ginning kept on hand in Australia, as hitherto no demand has existed for it. Such machinery as is in use has been directly imported from England or America.

TROPICAL AGRICULTURE IN NORTH QUEENSLAND.

It is satisfactory to learn from the "North Queensland Herald" that good progress is being made in North Queensland with the cultivation of tropical products other than sugar. Coffee production, however, from which such great things were expected, has not shared the confidence of Northern farmers. The reasons for this are not far to be sought—not, however, in Queensland. Then reasons we shall not enter into, as they enter the domain of politics, with which this Journal has nothing to do. Everyone knows that coffee thrives luxuriantly in the North—indeed, all over the State on the coast. The berry produced is infinitely superior, when properly handled, to Brazilian coffee, and quite equal to the Ceylon plantation and Jamaica product. Yet Queensland cannot compete, under present conditions, with coffee grown in countries where coloured labour is cheap. Perhaps under the new Bounties Act the industry will revive.

Cotton-growing, thanks chiefly to the skilled enterprise of Dr. Thomatis, of Cairns, is steadily making headway. The future of this branch of tropical agriculture as a contributor to the wealth production of North Queensland is made more certain by the method of initiating the industry which is being pursued. Many farmers are experimenting on a small scale in every district on this coast with cotton cultivation. That is a far better way of going to work than the big plantation plan. The good work which is being done by the department's expert in tobacco cultivation and preparation will, it is hoped, lead to similar means being adopted for encouraging cotton production. It should not be many years, if an enterprising policy be pursued, before North Queensland's product of coffee, cotton, and tobacco attracts many settlers to the wonderfully rich-soiled and well-watered land on its eastern coast. On the best of that land, where annual rainfalls may be measured by feet—or even yards—instead of inches, the strip of coast country lying between the Herbert and Daintree Rivers, the highly-profitable industry of rubber cultivation is sure to come to the aid of close settlement. It has been started already on the Johnstone River, and if the early operations are guided by practical knowledge development of rubber production is likely to be rapid. An occasional correspondent in London lately contributed articles advocating rubber cultivation here, and laughing at the idea of successful dairying in tropical Queensland. He is right about rubber, but, as a local critic of his articles pointed out, there is much of the Queensland coast where butter production under modern refrigerating conditions is quite practicable. In time to come, steamships will leave North Queensland ports for London by the Torres Strait route, carrying among other local products both rubber and butter, as well as cotton, coffee, sisal hemp, and, we hope, sugar. Whatever may be the fate of the sugar industry under white labour conditions, it is obviously desirable that its present predominance in local agriculture should be diminished. Single-crop countries run a terrible risk of disaster from temporary failure of their special product, through bad seasons and disease, as well as from a serious fall in its market value through over-production.

ABACA, SISAL, AND MAGUEY FIBRE IN THE PHILIPPINES.

Mr. H. T. Edwards, Fibre Expert to the United States Bureau of Agriculture, writing in a pamphlet issued by the Manila Merchants' Association, Philippine Islands, on the resources of that country, supplies the following very interesting information on the cultivation and profits of abaca (Manila hemp), maguey, and sisal fibres. We recommend all interested in tropical agriculture in Queensland to study Mr. Edwards's figures. Sisal and fourcroya (Mauritius hemp) are now being extensively planted in Queensland, and in the course of two or three years these fibres will figure largely in our list of exports. With regard to the abaca, we doubt if it would pay to grow it in this State, under

present labour conditions. The fibre in the Philippines is obtained by hand labour, assisted by a crude apparatus, which does not do away in the least with the hard manual toil of extracting the fibre from the banana stems. From what we can learn, there are few, if any, plantations where the abaca is cultivated, the fibre being obtained from wild plants, which are yearly becoming more difficult of access.

MAGUEY.

Maguey and sisal hemp are two fibres obtained from closely allied species of the same genus of plants. Both maguey and sisal hemp can be profitably cultivated in nearly all parts of the Philippine Islands. Maguey is now being extensively planted in many different provinces, and nearly 500,000 sisal plants have been imported into the islands and planted during the past year.

The production of sisal hemp within a period of comparatively few years has made Yucatan one of the richest States in the Republic of Mexico. This industry has had a remarkable development, and the demand for sisal hemp is steadily increasing. The imports of sisal hemp into the United States, as shown by the following figures, indicate the growth of the industry:—Imports of sisal hemp into the United States—1894, 48,468 tons, value 3,742,073 dollars; 1904, 109,214 tons, value 15,935,555 dollars. These figures show an increase in the value of the imports of this fibre of 328 per cent. in ten years.

The Philippine exports of maguey fibre have increased from 875 tons in 1901 to 2,328 tons for the first nine months of 1906. This fibre is now the export product of fifth importance in the islands.

The essential feature of the maguey industry, and that which recommends it to the Philippine planter, is its adaptability to the conditions prevailing in many parts of the islands. Maguey flourishes in localities where there is insufficient rainfall for abaca; it can be profitably grown on soils that will not grow sugar, rice, or corn; its cultivation requires but few draft animals and comparatively little labour; and there are several different improved machines for the extraction of the fibre.

Maguey has an advantage over abaca in that it cannot be blown down or uprooted by violent winds, and it has no known insect enemies of importance. These plants will grow well even in fissures of bare limestone rock, and the ideal maguey soil is a light loam composed of leaf mould and decomposed limestone. If fragments of undecomposed limestone are present in abundance, so much the better. Splendid maguey plants are growing in pure beach sand on the coasts of Mindoro and Tablas. The cultivation of the soil is not necessary before planting. It suffices to clear away the brush and grass with the bolo, and, after planting, to repeat this operation two or three times a year. While the plants will, without suffering severely, stand periods of drought longer than any which have ever occurred in these islands, they reach their best development if watered by occasional periods of rain.

Our rainy season not only renders it certain that young plants newly set out will speedily and firmly establish themselves, but assures the production by old plants of large crops of long leaves, while the occurrence of a well-marked dry season renders it equally certain that these leaves will produce a good percentage of high-grade fibre.

Maguey is propagated either from suckers or from the small bulbs produced on the flower-stalk. It should be planted in the rainy season, in rows 4½ by 12 feet apart, or about 800 plants to the acre. The first crop of fibre can be harvested in three years from the time of setting out sucker plants. The average annual yield is 20 leaves per plant, or 16,000 leaves per acre. The yield of fibre is from 40 to 50 lb. of fibre per 1,000 leaves, or from 640 to 800 lb. per acre. The New York quotations for maguey on 1st May, 1907, were—for No. 1, 7¼ cents per lb; and for No. 2, 6¾ cents per lb. Maguey plants continue to produce leaves for a period ranging from seven to twenty years.

The cultivation of maguey offers inducements to the small farmer and to the planter with large estates. This fibre is a staple commodity, the use of

which promises to increase quite as rapidly as the production. The development of this industry during the past few years indicates that maguey will become at no distant date one of the leading agricultural products of the Philippine Islands.

Manila Hemp.

Manila hemp, the leading cordage fibre of the world, is produced only in the Philippine Islands. This fibre is obtained from the stalk of a plant which closely resembles the common banana. Both the plant and the fibre are known in the islands as "abaca."

This one product, Manila hemp, constitutes more than two-thirds of the total value of all Philippine exports. The growing of hemp is one of the safest and at the same time one of the most profitable lines of agricultural investment in the islands. The introduction of improved methods of cultivation, irrigation, and machines for cleaning the fibre should make this industry even more profitable in the future than it has been in the past. With enormous areas of the finest hemp lands in the Philippines still untouched, the opportunities for the extension of the industry are almost unlimited.

Estimate of the Cost and Revenues of an Abaca Plantation.

The size selected for this plantation is 1,000 hectares (2,500 acres), which is the largest tract of public land that can either be leased or purchased in the Philippine Islands. It is entirely practicable, however, to establish abaca plantations on a smaller scale of, say, 500, 250, or even 100 acres. Planting 250 hectares a year, it would require four years to put a plantation of 1,000 hectares under cultivation. With respect to the cost of clearing and cultivating land and also the yield of hemp, there will be considerable variation, depending on local conditions in the province where the plantation is established.

All accounts in this statement are in United States currency.

FIRST YEAR.

Expenditures—	
Cost of 1,000 hectares, at $5 per hectare	$5,000
Clearing 250 hectares, at $15 per hectare	3,750
Purchase of 250,000 abaca stools, at $15 per 1,000	3,750
Planting 250 hectares, at $3 per hectare	750
Cultivation of 250 hectares, at $15 per hectare	3,750
Fencing and roads	1,000
Live stock	500
Buildings	1,000
Tools and implements	500
Overseer	1,800
Assistant overseer	1,200
Incidentals	1,000
Total	$24,000

SECOND YEAR.

Expenditures—	
Clearing 250 hectares	$3,750
Purchase of 250,000 abaca stools	3,750
Planting 250 hectares	750
Cultivation of 250 hectares (1st year planting)	2,500
Cultivation of 250 hectares (2nd year planting)	3,750
Fencing and roads	1,000
Overseer and assistant overseer	3,000
Interest on investment	1,440
Depreciation on buildings, tools, and animals, at 20 per cent.	400
Total	$20,340

THIRD YEAR.

Expenditures—	
Clearing 250 hectares	$3,750
250,000 abaca stools (obtained from home plantation) ...	1,000
Planting 250 hectares	750
Cultivating 750 hectares	6,250
Fencing and roads	1,000
Overseer and assistant overseer	3,000
Interest on investment	2,660
Depreciation	400
Total	$18,810
Income—	
Estimated yield, 12 piculs per hectare. From 250 hectares one-half crop for first year's cutting, less half for cleaning, or 750 piculs, at $10	7,500
Debit balance	$11,310

FOURTH YEAR.

Expenditures—	
Clearing 250 hectares	$3,750
250,000 abaca stools	1,000
Planting 250 hectares	750
Cultivating 750 hectares	6,250
Fencing and roads	1,000
Overseer and assistant overseer	3,000
Interest on investment...	3,339
Depreciation	400
Total	$19,489
Income—	
From 250 hectares, a full crop...	$15,000
From 250 hectares, 50 per cent. of full crop	7,500
	$22,500
Credit balance	3,011

FIFTH YEAR.

Expenditures—	
Cultivating 500 hectares	$3,500
Fencing and roads	1,000
Overseer and assistant overseer	4,500
Fixed interest and depreciation charges	4,000
Total	$13,000
Income—	
From 500 hectares, a full crop	$30,000
From 250 hectares, 50 per cent. of full crop	7,500
	$37,500
Credit balance	24,500

SIXTH YEAR.

Expenditures—	
Cultivating 250 hectares	$2,500
Overseer and assistant overseer	4,500
Fixed interest and depreciated charges	4,000
Total	$11,000

Income—	
From 750 hectares, full crop	$45,000
From 250 hectares, 50 per cent. of full crop	7,500
	$52,500
Credit balance	41,500

SEVENTH YEAR.

Expenditures—	
Overseer and assistant overseer	$5,000
Fixed interest and depreciation charges	4,000
Total	$9,000
Income—	
From 1,000 hectares, full crop	$60,000
Credit balance	51,000

Note.—After abaca is three years old it requires practically no further cultivation. It will produce a full crop without replanting for a period of from ten to fifteen years.

[To convert the above figures into British currency, divide by 5; 1 hectare = 2·471 acres.—Ed. Q.A.J.]

QUEENSLAND ARROWROOT.

During last month arrowroot-growers were busy harvesting the crop, and a considerable quantity of arrowroot was soon placed on the market. The crop is somewhat smaller than last year's. This may be accounted for mainly by the fact that some of the growers have either given up producing arrowroot, owing to the superior attractions of certain return and prompt monthly cheques pertaining to dairying. The Pimpama and Coomera districts are eminently suitable for dairying, being richly grassed, well watered, and sheltered. In view of the shortage in production, it is probable that higher prices will be the rule in future. Growers now ask £13 10s. to £14 per ton for the new season's make, and as the year advances prices will possibly advance.

PROLIFIC GROWTH OF CANE.

In the good old days of virgin scrubs in the Coomera, Nerang, Pimpama, Albert, and Logan districts, where the Bourbon cane, Green Ribbon, Salangore, &c., canes were grown, a yield of 80 to 100 tons of eighteen-months-old cane was so common as to excite little astonishment. When, however, one of the old school of planters mentions this at the present day, he is generally set down as being in his dotage and lost his memory. Sceptics should read the following and then be convinced that the planter of thirty-five years ago is no romancer:—

We ("Isis Recorder") were afforded the opportunity recently of viewing what may well be termed a prolific growth of cane on Mr. John Broadhurst's farm in the vicinity of Childers. It comprises about 3 acres of the Malabar variety, and the Colonial Sugar Refining Company's mill returns show that the yield was 84½ tons per acre. As may be judged from the last-named fact, the cane was something out of the ordinary, even in the fertile Isis. It was of eighteen months' growth, and had been planted on low-lying land, which had previously never produced any other crop except maize. So dense was the growth that it proved a veritable thicket to anyone wishing to make their

way through it, the trashed stalks showing an extent of 16 feet of crushable cane, 6 inches between the nodes, and containing twenty-six sticks to the stool, and that not in selected instances. Indeed, so remarkable was the development that Mr. Broadhurst received instructions from the mill management that the cane would have to be divided, as it was too long for the carrier!

INDIAN CANE.

Mr. David Curtis, dairy farmer at Tyagarah (says the "Richmond River Times"), has 3 acres of thin-stemmed sugar-cane, which he grows for fodder. He calls it Indian cane. It stood well, is sweet, and, in comparison with other sugar-canes, withstands the frost. Mr. Curtis states that this 3 acres of cane, which is growing on red soil land, will feed from sixty to eighty head of cattle for six months in the year. He procured it from Mr. Kempnich, of the Lower Clarence, some few years ago, and is immensely pleased with it. He considers that every dairy farmer should grow a couple of acres of it as a standby for winter feed.

MURAC.

The "Indiarubber World" gives the following particulars of a product, to which the name of "Murac" has been given, resulting from the treatment of the latex of certain plants of the *Sapotaceæ* family by a new chemical process. The trees are abundant along the Amazon River, in Venezuela, and the Guianas, as well as in some of the West Indian Islands, Africa, Madagascar, and Australia. As they yield latex freely, the supply is practically inexhaustible. Thus far, however, the new process is understood to have been applied only to balata.

Murac is referred to, not as a substitute for indiarubber, but as being serviceable for use in connection with low-grade qualities of rubber, bringing them up to a higher standard. Certain rubbers, for example, are mentioned as having been more than doubled in value by the addition of a few pence worth of murac to a pound in weight of the rubber to be improved. Murac, however, is vulcanisable alone, and may be used for many mechanical purposes, without the employment of other rubber, under treatment similar to that given to gutta-percha. It is also capable of being used in liquid form, particularly for water-proofing.

A PROFITABLE RUBBER PLANTATION IN THE STRAITS SETTLEMENTS.

The Bukit Asahan Rubber Estate, in the Straits Settlements, was begun as a small plantation in 1896 by Chinaman Tan Chay Yan, who extended its cultivation to 4,000 acres, 3,000 of which are fully planted (200 trees to the acre), and some 500 acres are now producing rubber. By 1910 the 4,000 acres will be ready for tapping.

This estate has recently been sold to a company, the original owners receiving £100,000 sterling in cash, and £133,333 in shares, more than 1,000,000 dollars gold for ten years' work.

In 1912, when the rubber-trees lately planted throughout the east are ready for tapping, the total amount of rubber secured will approximate about 10 per cent. of the present world's supply, not a serious factor in considering a probable lowering of the price of raw rubber.

Science.

BACTERIOLOGICAL DEPARTMENT.

Department of Agriculture and Stock.

Following the opportunity given by the transfer of the Bacteriological Institute to the Department of Agriculture and Stock, the following programme of work in connection with matters requiring early attention has been outlined. This programme, it must be understood, is entirely preliminary, and relates to the more urgent matters, and does not include other things that are part of the ordinary work of the Veterinary Surgeon and the Bacteriologist in connection with diseases in stock.

With regard to inoculation as a preventive of tick fever, as has already been announced in the Press and by circular to the agricultural societies, the Department is now ready to receive applications for inoculation, which will be carried out according to arrangement. The fact that an animal or animals will, in most cases, have to be taken to the scene of operation prevents fulfilling applications immediately they come to hand, and, therefore, it has been decided that, upon the receipt of a sufficient number of applications from a given centre, an inoculator will be sent to treat cattle that may be brought to him, for which the charge will be 3d. per head. The inoculator will also instruct owners how to subsequently perform the operation. The charge of 3d. per head has been made to recoup in some measure the cost of travelling throughout the country, but it will not nearly cover expenses.

The items before referred to as claiming the immediate attention of the Department are—

Blackleg.—During recent years, and particularly in coastal districts where closer settlement has taken place, this disease has considerably increased. This disease can be largely prevented by an annual systematic vaccination of all young stock within the infected districts. Experiments for the preparation and cultivation of a special vaccine to render animals immune to this disease will be conducted.

Protective Inoculation for Pleuro-pneumonia.—Research work will be at once started in endeavouring to isolate the micro-organism with the special object of cultivating it artificially outside the animal body for the purpose of preparing a preventive virus. While this work is in progress the supply of natural virus will be maintained, as far as is possible, in accordance with the demands.

Every facility is offered to stock-owners who, owing to circumstances, prefer to use virus collected by themselves, by having it examined free of charge for tubercle bacilli and septic organisms. In this case it will be necessary to forward to the institute suspected portions of the lungs, bronchial glands, and a quantity of chest virus.

Tuberculosis.—The suppression of this disease is highly desirable, and this can only be accomplished by the use of that almost infallible diagnostic agent—tuberculin. The whole work of stamping out this disease is to be based on Professor Bang's scheme, by which, although all diseased animals will be eliminated, the original number of animals in the herd can be maintained. This scheme was highly successful at St. Helena a few years ago in absolutely eradicating tuberculosis from that well-known dairy herd.

At the present time the incubators are being filled with cultures of tubercle bacilli to be used in the preparation of tuberculin.

Another highly important matter to command attention will be the discovery of some method whereby cattle, particularly the higher breeds, will be rendered immune to tuberculosis.

Swine Fever and other Diseases of Pigs.—There is still a large field for investigation in connection with the various diseases of swine. Efforts will be made to study the etiology of swine fever, and also extend the work which has been taken up in other countries in endeavouring to discover a cure or preventive for this disease.

Birdsville Horse Disease.—Although many inquiries have been made in connection with this trouble, so far the specific cause has not been discovered, nor has the means by which the disease spreads, its history, and pathology been thoroughly understood. From its contagious nature it is evidently due to some micro-organism. Exhaustive investigation will, therefore, be carried out which will include the bacteriology of the disease, pathology, clinical observations, and methods of treatment and preventive measures.

General Diseases of Stock.—Among the many diseases affecting our cattle, sheep, and horses which will receive a full measure of attention and investigation may be mentioned the following:—Actinomycosis, malignant œdema, stringhalt, pseudo-tuberculosis, septicæmia, pyemia, epithelioma, carcinoma, papilloma, tumours, cysts, and other abnormal growths and conditions. The life histories of the various internal and external parasites will also be observed.

Ticks and Flies.—Apart from the continuation of the study of the tick which causes redwater, there are other serious ailments brought about by other species of ticks and different kinds of flies, and about which very little is known.

Diseases of Poultry.—Special attention will be given to various poultry diseases, many of which are contagious, and often assume serious epidemic proportions.

Bacteriology in relation to the Dairying Industry.—This subject involves the study of various species of bacteria that are associated in the ripening of cream and cheese, and the nature of the different micro-organisms that impart those peculiar fishy flavours and odours that are to be found at times in different dairy products, often causing financial loss. These are matters deserving the very closest investigations and also the preparation of pure cultures of lactic bacteria to be used as starters in the ripening of cream in butter-making.

Another line of investigation that might be taken up with advantage is the use of certain micro-fungi, cultivated in a pure state, for the ripening and flavouring of special types of soft cheese, such as Roquefort and Cammelost.

Bacteriology in relation to General Agricultural Processes.—The scope of work in this direction is, practically speaking, without limit. There is a large field for work on the relation of bacteria to fermentative processes, such as—the change that takes place during the manufacture of tobacco, the preparation of ensilage, and the study of different nitrogen-forming bacteria found in the various leguminous plants.

Museum.—It may be mentioned that in connection with the institute there is a museum which contains over 500 specimens, largely illustrative of the various manifestations of the different diseases affecting stock, such as—tuberculosis, pleuro-pneumonia, swine fever, actinomycosis, animal parasites, &c. This collection, which is probably one of the most unique in Australia and of great educational value, will be continually added to, special attention being directed, wherever possible, to preserve the specimens in their natural colour by the formalin-glycerin process, which shows them to the very best advantage.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

Nineteenth Lesson.

Farm Crops as Foods. Functions of Foods. Nutrient Constituents of Foods and their Comparative Value. Digestibility of Foods. Nutritive Ratio. Feeding Standards. Composition of Fodders.

In our last lesson we studied farm crops with regard to their requirements for successful growth; now, we will have to consider them as food for animals, for which purpose farm crops are principally grown. Already, in our Seventeenth Lesson, we learned a few facts on the nutrition of animals, but we require to go a little deeper into this matter, and study briefly the principal **functions of food.**

Food, in the first place, serves to build up the animal frame, to renew and repair its tissues; secondly, food is required for the maintenance of the animal heat; further, for the performance of muscular labour, for the collection of reserve stores; and, lastly, for the general promotion of growth and increase.

A sharp distinction between the foods with regard to the accomplishment of these different functions cannot be made, but, generally speaking, we may divide foods into the following classes:—

(1) *Foods which produce animal tissue, chiefly flesh and muscles;*

(2) *Foods which build up principally fatty tissue;*

(3) *Foods which more particularly produce heat.*

The **nutrients,** those important chemical compounds found in foods which are the active principles influencing animal growth and nutrition, may be simply classified into **nitrogenous** and **nitrogen-free compounds.**

The most important nitrogenous compounds of fodders are the **proteins,** already enumerated in our Sixteenth Lesson, as they are the **flesh-forming nutrients** of foods. In an ordinary fodder analysis the total amount of nitrogen is determined, and this percentage of total nitrogen is multiplied by 6·25 ($= \frac{100}{16}$), under the assumption that the proteins contain on an average 16 per cent. of nitrogen, and the result recorded as **crude protein.** This crude protein will, naturally, include various other nitrogenous compounds, possessing all different feeding values, and for this reason in modern fodder analysis **true proteins** are separately determined. The amides, some of the more important nitrogenous compounds, seem to have less feeding value than true proteins.

To the nitrogen-free compounds of foods belong, in the first place, **fats and oils**—in fodder analysis generally reported as **crude fat**—which are estimated

by extracting the finely-ground dried fodder with ether or another suitable solvent. Fats and oils are the principal **heat-producing nutrients**, and also produce fat in the animal bodies.

The most abundant nitrogen-free compounds of fodders are the **carbohydrates**, to which group of organic compound (*see* Thirteenth Lesson) *cellulose* or *fibre*, *starch*, and *sugars* belong. The carbohydrates are also principally **heat producers**, but may, if fed in excess, form also fat. The different nutrients vary considerably with regard to the amount of heat they produce, and their **calorimetric** or **heat values** have been practically determined by different scientists. Rubner found that the amount of heat produced in an animal by 100 lb. of fat can only be produced by 225 lb. of proteins, 232 lb. of starch, 234 lb. of cane sugar. These values may be expressed in a different manner, calling the heat value of starch equal to 100. The **heat-producing** power of other nutrients is as follows (according to a table in Warrington's "Chemistry of the Farm"):—

Fat	= 229	Glucose and milk sugar ...	= 90
Proteins	= 107	Cellulose (about)	= 86
Starch	= 100	Asparagin (an amide)	= 49
Cane sugar	= 97		

Another important member of the carbohydrate class of nutrients is the cellulose, generally reported as **crude fibre** in fodder analysis. The fodders are in succession boiled for a certain length of time with dilute solution of acids, then with a dilute alkali, followed by washing with water, alcohol, and ether, leaving a residue of cellular tissue or *woody fibre* consisting chiefly of cellulose and ligno-cellulose. Other carbohydrates—as starch, sugars—are determined in more complete fodder analyses, but frequently only the value of **nitrogen-free extract** is given, a value determined by difference by deducting the total of the calculated amounts of crude proteins, crude fat, crude fibre, and ash from 100. This nitrogen-free extract embraces all the carbo-hydrates—starch, sugars, gums—and also other organic substances like pectin or mucilage, &c.

A further class of non-nitrogenous constituents of fodders are the mineral matters which are contained in the **crude ash**, obtained on burning the dry fodders. Although the amounts of ash in fodders are generally small, still the mineral nutrients are of the greatest importance, as liberal amounts of lime and phosphoric acid, and smaller amounts of potash, magnesium, sodium chloride, &c., have to be supplied in the fodders, more particularly to young growing animals. Even the adult animals require mineral matters, and as an instance I may state that, in accordance to determination made by Stohmann, a cow of 1,000 lb. live weight requires a minimum daily supply of 1·4 oz. of phosphoric acid, 2·1 oz. of lime, and 3·8 oz. of potash, which, however, are supplied by a daily ration of 30 lb. of good hay, which contains on an average about 2 oz. of phosphoric acid, 4 oz. of lime, and 6·2 oz. of potash.

It is not only the composition of a fodder which determines its value as a food, but of equal importance is the **digestibility** of the various nutritious constituents. The digestibility of fodder is influenced by the age of the crop, the conditions of growth, the treatment of the crop at time of harvesting, and, lastly, to a large extent depends on the animal itself consuming such fodder. As a general rule, it may be stated that all **ruminants**—animals like oxen, cows, sheep, goats, which chew their cuds—digest a much larger proportion of the nutrients in foods than non-ruminant animals like horses, pigs, &c. This statement applies more particularly to the coarser and bulky fodders, and a horse, for instance, digests about 20 per cent. less of the crude fibre in

straw than a sheep. I will now give a table showing the percentage amounts of the nutrients digested by different animals:—

PERCENTAGE OF NUTRIENTS DIGESTED.

	Proteins.	Carbo-hydrates.	Crude Fibre.	Crude Fat.	Total Dry Organic Matter.
By Ruminants—					
Pasture grass	70	73	76	63	71
Meadow hay	57	64	60	53	61
Lucerne, green	78	67	34	44	58
Lucerne, hay	74	66	43	39	60
Green maize	73	67	72	75	70
Green sorghum	62	78	59	85	73
Wheat straw	11	38	52	31	43
Potatoes	61	90	...	...	85
Mangolds	77	96	...	...	88
Maize (corn)	76	93	58	86	91
Wheat bran	79	69	22	68	61
By Horses—					
Pasture grass	60	66	57	13	62
Meadow hay	57	55	36	24	48
Lucerne hay	73	70	40	14	58
Wheat straw	19	18	27	...	23
Potatoes	99	88	9	...	93
Maize	77	94	70	61	89
By Pigs—					
Maize meal	86	95	40	76	92
Wheat	70	74	30	60	72
Wheat bran	75	66	34	72	61
Potatoes	73	98	55	...	93
Sour milk	96	99	...	95	95

This table of the digestible portions of nutrients has to be used in connection with the table giving the composition of fodders, in order that the amount of fodders required by the animals may be calculated. We take, for instance, paspalum hay, which, according to the analysis given in the table of fodders at the end of the lesson, contains—

9·9 per cent. of crude proteins;
36·8 per cent. of carbohydrates (nitrogen free extract);
32·5 per cent. of crude fibre;
1·2 per cent. of crude fat;
80·4 per cent. of total dry organic matter;

of which a cow digests (meadow hay) 57, 64, 60, 53, and 61 per cent. respectively, and a horse 57, 55, 36, 24, and 48 per cent. respectively; so that in *100 lb. of paspalum hay* the following amounts of nutritious constituents are digested:—

	By a Cow. lb.	By a Horse. lb.
Crude proteins	5·6	5·6
Crude carbohydrates	23·6	20·2
Crude fibre	19·5	11·7
Crude fat	·6	·3
Total organic matter	49·2	38·6

Remembering now the various functions of foods, it will be easily understood that animals will require various fodders in different quantities in order that the necessary nutrient constituents are supplied. Some of the earliest and most complete experiments to find the feeding standards required by the farm animals were carried out in the early sixties by Professor von Wolff; the results, which are still being used to the present day, are published in his "Fütterungslehre," which appeared in an English translation as "*Farm foods*

or the rational feeding of farm animals," and with the aid of these results any practical man can calculate the amounts of foods required, and supplied in the most economic way to his cows, horses, pigs, &c. It was found that, for most economic feeding, a certain ratio between the amounts of nitrogenous and non-nitrogenous constituents must exist, and mixtures of various fodders supplying these necessary amounts are called "**balanced rations.**" The standard rations will have to be altered according to local conditions, market price of certain fodders, climatic conditions, age and breed of animals, on the state of animals, if at rest or working, &c. The *ratio* between the *digestible proteins* (albuminoids) and the *digestible non-nitrogenous nutrients* is generally called the **albuminoid** or **nutritive ratio** of a fodder. In the calculation of this value the high amount of heat produced by fats is taken into consideration; taking the heat produced by fat as 2·3 times the heat given by a similar amount of starch, and we get thus the formula—

$$\text{Nutritive Ratio} = \frac{\text{digestible proteins.}}{\text{digest. Carbohydr.} + \text{dig. fats} \times 2{\cdot}3.}$$

The nutritive ratio has to fall between certain limits in order that the food supplied to the animal does not lead to any waste and still keeps the animal in good health and condition. The ratio will be different for growing animals and adult animals, and, as a rule, the younger the animal the higher the ratio required, as in this case the chief function of food is to build up tissues, and for this purpose chiefly proteins are necessary. We see that milk, which is the natural fodder of young animals, has a very high nutritive ratio of about 1 : 3—that is, one part of proteins to 3 parts of carbohydrates plus fats. As a rule, it may be stated that young animals require a ratio of about 1 : 4 to 1 : 5; for adult animals, the ratio should be about 1 : 6; and for the fattening of animals a ratio of only 1 : 8, or even less, is sufficient. Milking cows require a high ratio of about 1 : 5·4, and the ratio and also the amount of food should vary for each cow in accordance with the quantity of milk given, and a very heavy milker requires a ratio of at least 1 : 4·5.

The following short table gives von Wolff's **feeding standards** for the different animals:—

FEEDING STANDARD.

Digestible Nutrients required per day and per 1,000 lb. life weight.

	Total Organic Matter.	Protein.	Carbohydrates.	Fat.	Nutr. Ratio.
	Lb.	Lb.	Lb.	Lb.	
Ox at rest	17·5	·7	8·0	·2	1 : 12
Ox heavily worked	26·0	2·4	13·2	·5	1 : 6
Milch cow	24·0	2·5	12·5	·4	1 : 5·4
Horse, moderately worked ...	22·5	1·8	11·2	·6	1 : 7
Horse, heavily worked ...	25·5	2·8	13·4	·8	1 : 5·5
Fattening pigs, first period ...	36·0	5·0	27·5		1 : 5·5
Fattening pigs, second period	31·0	4·0	24·0		1 : 6
Fattening pigs, third period	23·0	2·7	17·5		1 : 6·5

FEEDING STANDARD FOR MILK COWS ACCORDING TO ATWATER AND PHELPS.

Cows of 950 to 1,100 lb. life weight require, if yielding—

Lb. Milk.	Total Organic Matter.	Protein.	Carbohydrates.	Fat.	Nutr. Ratio.
	Lb.	Lb.	Lb.	Lb.	
10 to 20	22-24	2·3	12-14	·4-·6	1 : 6·1
20 to 25	23-25	2·6	12-14	·5-·7	1 : 5·5
25 to 30	23-25	2·9	12-14	·5-·7	1 : 5·0
30 to 35	24-26	3·2	13-15	·6-·8	1 : 4·9
35 to 40	24-26	3·5	13-15	·6-·8	1 : 4·4

A cow yielding about 25 lb. of milk daily requires a certain amount of digestible nutrients, which could be made up in different manners by the following rations:—

9 lb. of lucerne hay,	18 lb. oaten hay,	13 lb. lucerne hay,
35 lb. of corn silage,	3 lb. bran,	13 lb. barley hay,
9 lb. of wheat bran	3 lb. middlings,	2 lb. wheat bran,
(Ratio, 1 : 5·1),	2 lb. linseed meal,	2 lb. crushed barley
	1 lb. cotton-seed meal	(Ratio, 1 : 5),
	(Ratio, 1 : 5·2),	

or by about 27 lb. of good lucerne hay.

It has often been attempted to calculate comparative values of rations from the money value of the nutritious constituents they contain, in order to find the most economic manner of feeding, but the results have not been very satisfactory, as they are influenced by so many factors, many of which—as, for instance, flavour, succulence—cannot be expressed numerically.

Another very important factor in the choosing of rations, more especially for milking cows, is the **effect of foods on the flavour** of the milk, and flavour of the butter and cheese manufactured from such milk, as some of our richest fodders give a particular, frequently very undesirable, flavour. Lucerne hay is an ideal food for milch cows, but green lucerne tends to produce a peculiar flavour, and still more so lucerne ensilage gives a most pronounced and disagreeable flavour to butter, so that the making of lucerne into ensilage as a feed for dairy cows cannot be recommended. A very common weed, a leguminous plant, found at times very plentifully in some of our pastures, is the wild clover, which increases the milk and butter yield, if fed in large quantities, but at the same time gives such a pronounced bad flavour to the butter that factories had to refuse to take the cream from places where cows were feeding largely on this weed. The influence of certain fodders on the flavour and composition of butter and cheese is a very interesting and important field for research, and anyone having made any observations on this matter would confer a favour in communicating such results to the writer of these lessons.

We will now enter upon the closer study of some of the most important fodders, and I must draw attention to the table of the composition of fodders, given at the end of this lesson. The greatest number of analyses have been carried out at our own laboratory, the results being published more fully in our annual reports. The analyses marked "A" are the work of American investigators, and the analyses marked "H" are taken from Henry's work on "*Feeds and feeding.*" For comparison, I also give the amounts of true protein as determined by us to show the difference between it and the crude protein usually given in fodder analysis; and I further give in a few cases the value of an albuminoid ratio, which takes in account the total amounts of proteids, and which, therefore, shows too favourable a value when compared with the true nutritive ratio of digestible protein and digestible carbohydrates.

One of the most generally used fodder crops is unquestionably ordinary **pasture.** Pasture consists of a great variety of herbage, amongst which grasses are predominant. A great difference exists between the nutritive value of the grasses, but fortunately many of our indigenous grasses, more particularly in their earlier stages of growth, and also many of the introduced grasses, which grow well in our State, are very valuable fodders. One of the most nutritious grasses is **Couch grass,** for which grass all animals show a particular liking; but other grasses, like **Prairie grass, Paspalum dilatatum, Canary grass,** come very close with regard to their nutritive ratio, and are really more valuable as fodders, because they yield such heavy crops. The value of grasses will always vary in accordance to the soil of the locality where they are grown, and it is also influenced by the seasons. Some grasses keep green right through our

winter, giving a good heavy crop of winter feed, whereas others give the best crops in summer. For these reasons it is necessary to choose for each district the most profitable grasses, and this can only be done by careful practical experiments.

Heavy crops of grasses are frequently preserved for future use by being made into **hay**, which process consists in drying the cut crop by exposure to sun and air. Dry herbage can then be collected in stack, and it will keep for any length of time, as it is not liable to fermentation and rot like green grass. Whereas ordinary pasture grass contains from 65 to 75 per cent. of water, in hay the moisture is reduced to about 10 per cent.

Already, in our previous lesson, I drew attention to the fact of a migration of plant foods in crops, due to which the composition of the crop changes at different age; as a rule, the green fodder crops are most nutritious at the time of flowering, and at that time the grasses are cut most profitably for hay-making. By the process of hay-making, the *digestibility* of all the nutrients is unquestionably *lowered*, but this loss in amount of digestible food is well compensated by the fact that hay contains a much greater percentage of dry matter and nutrients than the green grass, the crop is cut when it is most nutritious, and again hay will be available as a food when other fodders are scarce. When hay contains too much moisture when stacked, a process of fermentation will set in, which may lead to such an increase of temperature as to set the stack on fire. The principal remedies to prevent such occurrences is to have the hay well dried, and to construct the stack properly ventilated. A certain amount of fermentation always takes place in a hay stack, and is, in fact, absolutely necessary to get a hay having a fresh colour and good flavour.

Very heavy crops of artificial grasses and also of other green crops, more particularly of maize and of sorghums, can be preserved in a succulent stage by being made into **ensilage**. The freshly-cut green crops are stored, preferably after being chaffed, in pits, or more generally in large tank-like structures called silos. The crop is well pressed down in these silos, and they are gradually filled up. A fermentation under exclusion of air takes place, and, in accordance to the manner of filling the silo, the fermentation produces a higher or lower temperature, the former producing a sweet and the latter a sour silage. The fermentation has an influence on the nutrients of the fodder; carbohydrates are partially lost, and also some of the proteins are decomposed; again, the digestibility of the remaining proteins is considerably lowered. These, again, are compensated by the succulence and palatability of the ensilage as a fodder. No better ration for cows could be found than a mixture of lucerne hay, corn ensilage, with a small amount of bran and pollard. Of all the crops young maize, cut at the time when the cobs have formed but are still soft, is unquestionably the most profitable one, producing a highly nutritious and palatable fodder. Sorghums come next as crops for silage, but, as they contain a rather high amount of sugar, they lose more by fermentation, and the fermentation is liable to be too vigorous. Other green crops, as cowpeas, lucerne, etc., are made into ensilage, but the latter cannot be recommended, as not only the losses of the valuable proteins are too high, but because lucerne ensilage has a disagreeable flavour, and gives a most pronounced bad flavour to butter.

To the coarser kinds of fodders must be classed the **straw of cereals**, which are a good food for cattle and horses when mixed with some richer fodders. As already pointed out, ruminants digest the largest portion of the nutrients in straw, and, again, of this class of animals sheep utilise the greatest amounts.

Root crops are characterised by the small amount of proteins they contain, and, again, by the very high amount of water. In some of the roots, as turnips, mangolds, and beets, the carbohydrates are found chiefly in form of sugars.

Potatoes are extensively used as food by man and also animals; they contain large amounts of starch, but, again, only small amounts of proteins.

The most concentrated foods are obtained from the seeds of cereals, legumes, and other crops, and of the by-products obtained from such seeds.

Wheat is one of our principal food grains, as it gives by the process of milling a highly nutritious flour, and leaves as by-products bran, middlings, and pollard, which are excellent food for cattle, horses, pigs, &c. In the milling of wheat about 70 per cent. of flour is attained, the rest—30 per cent.— being bran and pollard. Pollard and bran are much richer in nitrogenous matters than flour. For the feeding of poultry inferior classes of wheat—shrivelled and shrunken grains, obtained when the wheat is cleaned for milling purposes, are used, but these pinched grains contain, as a rule, a higher percentage of proteins than the plumper grains, and are for this reason a more valuable food for poultry.

Maize or corn, which is very largely grown as a food grain in our State, is rich in proteins, fat, and carbohydrates, and our locally-grown grain is characterised by containing a particularly high amount of proteins as compared with the averages of the composition of the grain of other countries. The average of a great number of analyses of Queensland-grown maize showed 13·1 per cent. of proteins, against 10·3 per cent. contained on an average in American corn, and for this reason our maize is a more nutritious and less fattening food than maize is generally considered to be.

The herbage of **leguminous crops** are the most highly nutritious of our fodder plants; for this reason such plants form a valuable portion of the herbage of pastures, and they are also frequently grown as green manure crops. One of our most important fodder crops is **lucerne,** which grows luxuriantly on our heavy black soils. Lucerne requires to be cut at a fairly young stage, as the fibre rapidly increases with age. The most concentrated nitrogenous foods are obtained from the seeds of leguminous plants, as **peas, beans, lupines, cowpeas,** &c., and the proteins of these seeds are also in a very digestible form.

Other valuable concentrated foods are the **oil-cakes,** obtained as by-products in the manufacture of oil from oil-yielding seeds. With the aid of powerful hydraulic presses the oil seeds are made to yield about three-quarters of the total amount of crude fat they contain, and leave a residue in the form of solid cakes, which still contain a fair amount of oil, and are very rich in proteins and mineral matters, chiefly phosphates. The most important of these fodders are **cocoanut oil cake, earthnut** or **peanut cake, linseed cake, cotton-seed cake,** and **rape cake.**

Another valuable by-product, of which millions of gallons go annually to waste, in our State, are the raw **molasses** of sugar-mills. Molasses contain from 65 to 75 per cent. of sugars, for this reason are a highly fattening food, and are most advantageously used in conjunction with such too nitrogenous foods as oil cakes.

Questions to Nineteenth Lesson.

1. Which are the most important constituents of foods, and what are their functions?
2. Which foods produce most heat when consumed?
3. Which nutrients are generally recorded in ordinary fodder analysis?
4. Why is the amount of crude proteins given misleading?
5. By what conditions is the digestibility of foods influenced?
6. How do different classes of animals compare with regard to the digestion of fodder?
7. What do you understand by the expressions "balanced rations" and "nutritive ratio"?
8. What is the usual food standard for a milking cow?
9. What is the difference between green grass and hay with regard to their value as fodder?
10. Which crops are most suitable for ensilage making?
11. Why should lucerne not be made into silage?
12. What are concentrated foods?
13. What by-products should be utilised as fodders?

COMPOSITION OF FODDERS.

—	Water.	Crude Ash.	Crude Fibre.	Carbohydrates, &c., Nitrogen Free Extract.	True Carbohydrates, Starch, and Sugars.	Crude Fat.	Crude Proteins.	True Proteins.	Albuminoid Ratio.	True Nutritive Ratio.
	In Percentage.								1 to :	1 to :
Green Fodders.										
Good bush grass: *Eriochloa punct.*	61·1	4·8	10·1	19·0	7·4	·7	4·3	2·5	...	12·5
Good bush grass: Wheeping Mitchell	62·1	3·0	11·6	20·4	7·3	·7	2·2	1·5	...	22·0
Couch grass	65·5	3 9	8·5	16·5	12·9	·4	5·2	3·7	...	5·7
Buffalo grass	77·4	2·5	4·6	12·3	6·1	·5	2·7	2·1	...	9·0
Prairie grass	71·5	2·0	6·8	14·9	5·2	·5	4·3	2·7	4·8	6·9
Canary grass	76·5	2·2	5·3	12·2	3·3	·4	3·4	2·8	4·2	5·2
Paspalum dilatatum ...	72·8	3·4	9·6	10·9	4·8	·4	2·9	2·1	4·8	6·1
Russell River grass (*Paspal. gal.*)	70·0	2·7	10·0	14·0	6·6	1·4	1·9	...	...	15·4
Lucerne	76·2	3·1	4·3	9·4	1·6	·3	6·7	3·9	2·3	2·5
Cowpea vines	70·9	3·6	10·9	9·2	3·7	·8	4·6	4·4	...	3·9
Sweet potato vines	87·6	2·1	1·9	6·1	1·3	·4	1·9	1·7	...	2·7
Sorghum (Collier)	67·9	3·7	12·1	12·7	8·1	·5	3·1	2·6	...	13·7
,, ... H	79·4	1·1	6·1	11·6	...	·5	1·3	...	...	21·8
Maize (Golden Nugget) ...	74·6	1·5	7·9	13·5	6·1	·2	2·3	1·8	...	12·7
Sugar-cane tops	71·2	1·9	10·0	13·5	4·6	·8	2·6	...	...	10·9
Prickly-pear leaves	94·4	1·5	·8	2·8	·2	Trace	·5	...	...	8·0
Saltbush	79·2	3·5	4·0	8·3	1·1	·8	4·2	...	...	3·7
Hay, Chaff, Ensilage.										
Bush hay (good)	6·5	6·1	39·8	39·6	...	1·9	6·1	5·6	...	15·0
,, (fair)	8·3	8·4	39·1	38·7	...	1·6	3·9	2·7	...	29·0
Prairie grass hay	8·9	6·5	21·7	47·5	17·0	1·6	13·8	8 7	4·8	6·9
Canary grass hay	11·3	8·1	20·0	43·7	12·3	1·6	15·3	10·3	4·2	5·2
Paspalum hay	8·1	11·5	32·5	36·8	16·3	1·2	9·9	7·0	4·8	6·1
Lucerne hay	8·6	12·0	16·5	34·3	6·1	1·1	27·5	15·1	2·3	2·5
Wheat straw ... H	9·6	4·2	38·1	43·4	...	1·3	3·4	...	...	93·0
Oaten straw ... H	9·2	5·1	37·0	42·4	...	2·3	4·0	...	...	33·6
Sorghum ensilage	76·4	2·1	6·7	13·3	2·5	·4	1·1	·8	13 0	22·1
Maize ensilage	78·4	2·6	5·2	11·7	2·7	·3	1·8	1·2	8·0	11·3
,, ,, ... A	75·4	1·6	6·4	13·8	...	·8	2·1	...	...	11·7
Roots, &c.										
Potatoes .. ... A	78·9	1·0	·6	17·3	...	·1	2·1	...	...	18·4
,, Sweet ... A	71·1	1·0	1·3	24·7	...	·4	1·5	...	...	20·0
Mangolds ... ... H	90·9	1·1	·9	5·5	...	·2	1·4	...	...	5·1
Turnips ... ... H	90·5	·8	1·2	6·2	...	·2	1·1	...	...	7·7
Swedes ... ... A	88·6	1·2	1·3	7·5	...	·2	1·2	...	...	8·5
Grains, &c.										
Maize	12·0	1·6	2·0	65·8	...	5·5	13·1	...	...	6·7
,, ... A	10·6	1·5	2·2	70·4	..	5·0	10·3	...	...	9·8
Wheat	11·1	1·3	3·2	67·4	62·4	2·2	14·8	...	...	5·7
,, plump ... A	11·5	1·8	2·5	70·4	...	2·0	11·9	...	...	5·6
,, shrunken	8·3	2·3	3·5	66·8	...	3 0	17·1	...	...	3·7
Barley ... ... A	10·1	2·9	2·3	69·6	...	3·1	12·0	...	...	7·1
Oats ... ... H	11·0	3·0	9·5	59·7	...	5·0	11·8	...	...	6·2
Peas	10·5	2·6	14·4	51·1	...	1·2	20·2	...	...	3·7
Rice ... ... A	12·3	·3	·2	78·6	...	·4	8·4	...	...	11·8
Sunflower seeds ... H	8·6	2·6	29·9	21·4	...	21·2	16·3	...	...	7·1
Kafir corn ... ... A	9·3	1·5	1·4	74·9	...	3·0	9·9	...	...	10·3
By-products, &c.										
Brewers' grains (wet) A	75·7	1·0	3·8	12·5	...	1·6	5·1	...	...	2·2
Wheat bran ... ... A	11·7	5·2	8·2	57·3	...	3·6	14·1	...	...	4·3
,, pollard ... A	11·7	2·9	4·9	60·9	...	4·5	15·2	...	...	5·1
Corn cobs	8·4	1·7	32·0	54·7	29·2	·7	2·5	..	...	38·7
Cocoanut oil cake	14·1	4·4	9·5	42·1	...	10·4	19·5	...	...	3·9
Cotton-seed meal	9·9	4·9	3·2	22·6	...	12·2	47·3	...	...	1·0
Peanut meal ... ... H	10·7	4·9	5·1	23·7	...	8·0	47·6	...	...	0·9
Dried blood	8·5	...	...	...	...	2·5	84·4	...	...	0·07
Milk	87·2	·7	...	...	4·9	3·7	3·6	...	...	3·1
Skim milk	90·6	·7	...	..	5·3	·1	3·3	...	...	1·7

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.					1907.							
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.
North.													
Bowen	0·36	3·41	1·76	0·99	11·01	2·53	3·74	1·97	0·39	3·46	2·87	Nil	1·28
Cairns	1·79	1·57	0·56	13·26	11·31	18·36	11·49	3·26	3·35	8·65	4·45	0·12	0·39
Geraldton	6·65	4·26	2·28	21·08	21·20	29·58	25·26	4·58	6·08	21·91	8·54	2·39	*4·66
Herberton	0·55	0·38	0·30	5·16	10·82	10·56	11·77	2·05	0·90	1·57	2·71	Nil	0·11
Hughenden	Nil	0·92	0·61	0·51	4·76	1·98	3·83	1·17	0·16	1·34	0·95	1·16	Nil
Kamerunga State Nurs.	2·03	2·56	0·72	10·00	8·17	15·78	14·82	4·87	2·80	9·33	5·29	0·13	1·15
Longreach	Nil	4·11	2·16	0·66	0·51	1·22	0·49	1·88	0·85	0·93	0·40	0·49	0·04
Lucinda	...	Nil	1·85	6·60	*22·36	12·38	23·82	4·53	3·92	19·29	6·34	0·29	1·05
Mackay	0·93	4·35	2·63	1·80	12·93	2·72	6·42	8·01	1·58	*6·09	5·04	0·27	0·25
Rockhampton	2·61	3·80	1·07	0·46	5·19	4·15	4·42	3·05	0·44	0·94	4·16	0·84	0·47
Townsville	0·46	3·25	1·45	7·74	14·03	12·49	7·75	7·37	1·03	3·11	2·38	Nil	0·07
South.													
Barcaldine	Nil	2·88	2·92	1·33	1·04	3·44	0·43	1·51	0·82	0·34	2·03	0·87	0·06
Beenleigh	2·94	3·47	2·94	1·75	3·98	4·75	3·88	4·17	0·58	4·70	4·92	0·71	*0·58
Biggenden State Farm	3·02	5·07	1·19	3·09	4·55	5·77	3·55	10·91	0·34	4·02	5·24	1·51	0·96
Blackall	0·02	4·70	5·86	1·37	1·96	2·30	Nil	2·78	1·69	0·20	0·36	1·36	0·06
Brisbane	4·21	3·48	3·81	1·07	3·28	2·69	5·23	5·32	0·45	4·75	2·91	0·39	0·79
Bundaberg	1·86	10·90	1·57	0·97	3·85	3·29	3·90	12·81	0·38	3·08	4·49	0·87	0·43
Caboolture	3·02	4·77	4·73	4·26	3·15	2·53	8·03	9·04	0·78	3·10	4·98	0·73	0·32
Charleville	0·35	4·99	2 66	1·30	3·71	0·85	Nil	2·75	2·29	0·26	0·90	1·04	0·76
Dalby	2·78	2·65	2·96	2·12	5·67	5·60	1·34	3·72	0·20	2·26	2·35	0·87	0·71
Emerald	1·62	4·47	1·55	2·32	1·79	7·36	3·67	7·66	Nil	Nil	2·53	1·75	0·10
Esk	4·51	4·14	2·90	2·45	5·26	2·87	6·79	3·60	0·22	5·42	2·66	0·54	0·81
Gatton Agric. College	3·73	3·54	2·25	2·01	3·45	2·62	6·44	2·71	Nil	2·80	1·85	0·54	0·56
Gayndah	2·34	5·14	2·25	4·25	2·82	3·00	1·91	6·89	Nil	2·65	3·00	1·21	0·53
Gindie State Farm ...	1·46	4·57	3·20	2·95	1·45	6·13	0·71	10·10	Nil	Nil	2·29	1·58	*0·10
Goondiwindi	4·35	3·33	2·36	2·32	4·04	5·37	1·77	6·51	0·33	1·30	1·09	1·62	0·95
Gympie	3·19	3·97	3·03	4·12	5·32	3·99	6·96	8·93	1·12	3·84	3·77	0·80	0·17
Ipswich	2·59	2·94	2·60	0·71	4·22	2·17	5·38	1·95	0·12	3·43	2·22	0·30	0·43
Laidley	3·26	3·19	2·87	1·78	4·12	2·84	4·50	3·47	Nil	2·99	1·56	0·45	0·58
Maryborough	2·31	6·48	1·22	2·49	4·39	5·52	7·84	10·28	1·25	3·21	6·05	0·64	0·93
Nambour	4·52	8·94	4·89	3·40	6·74	5·74	12·05	13·30	1·36	4·54	6·96	1·08	1·13
Nerang	3·56	6·42	8·26	2·75	6·33	9·86	6·04	7·83	1·48	7·74	5·08	1·26	1·35
Roma	1·47	4·43	2·37	1·32	4·31	6·32	2·92	1·87	0·42	0·27	2·47	1·03	0·42
Stanthorpe	3·37	4·29	2·90	2·49	4·89	4·33	3·30	5·98	1·68	1·79	2·44	1·06	1·65
Tambo	0·07	5·17	2·85	1·23	1·16	4·74	1·41	3·58	3·69	0·11	0·89	1·42	0·09
Taroom	2·30	4·26	1·70	1·35	5·49	5·16	1·10	1·86	Nil	1·01	3·76	0·70	0·04
Tewantin	4·25	6·37	4·38	2·73	9·53	6·38	15·83	11·45	1·87	7·16	7·61	1·48	0·95
Texas	3·22	2·77	3·42	2·23	1·83	4·69	4·55	6·16	0·65	0·93	1·62	1·31	0·87
Toowoomba	3·63	4·55	2·76	2·65	4·11	3·94	4·00	4·81	0·01	4·61	3·34	0·91	0·65
Warwick	3·85	3·13	2·47	2·99	5·50	3·95	2·52	5·71	0·51	1·58	1·27	1·16	1·37
Westbrook	2·80	3·34	3·41	1·79	1·18	1·79	2·91	5·13	0·02	2·53	2·53	1·04	1·78

* Compiled from telegraphic reports.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

THE ONLY MONUMENT TO A PIG.

It is said that the only monument in existence to a pig is to be seen at Luneburg, Hanover. At the Hotel de Ville is, or was, a glass case containing a ham in fair preservation, while near it is a slab of black marble with a Latin inscription:—"Passer-by, contemplate the mortal remains of the pig which acquired for itself imperishable glory by discoverng the salt springs of Luneburg."

Although there may be only one monument to the pig, yet there are curious Greek coins in existence bearing the effigy of a villainous-looking razor-backed pig with a litter of seven, which more resemble ticks than piglets, surmounted by the legend VIZIOAZI. The coin is of silver, about the size of a florin, but much thicker and heavier. It may have been a prize medal for best sow and litter at an agricultural show. If so, the average Greek pig must have been a woeful-looking lot, although the princely wooers of the faithful Penelope appear to have enjoyed Ulysses's pigs immensely.

The coin is depicted in this Journal, Vol. IX., Sept., 1901, p. 354.

A PROLIFIC PIG.

An American farmer submits a breeding-sow record to "Hoard's Dairyman." He states:—"She was farrowed on 10th August, 1902. She farrowed 15 pigs on 1st September, 1903; on 2nd March, 1904, 17; on 11th September, 1904, 16; on 6th March, 1905, 17; on 8th September, 1905, 17; on 3rd March, 1906, 17; on 29th August, 1906, 18. And out of this number she raised 90 pigs, the half of which I sold for breeding purposes. She is a purebred Yorkshire sow, and has always been bred to a purebred Yorkshire boar. You will see that this sow has had 52 pigs within the last year."

COST OF DISCOVERING AMERICA.

In these days of big salaries for special services it is interesting to learn what it cost to discover a continent which to-day holds a population of nearly 90,000,000 people, and which is the greatest and richest agricultural country in the civilised world.

An American delver into the history of the United States has unearthed a record of the cost of discovering America. According to this presumably authentic statement, the salary received by Columbus was 320 dollars a year—less than 1 dollar or 4s. 2d. a day. His captains got 180 dollars (£36) a year each. His crew got 2¼ dollars (8s. 5½d.) a month. To equip the expedition that discovered America cost 2,800 dollars (£560). The total cost of discovering America was 7,200 dollars (£1,440). To-day it costs £100,000 to try and find a possible continent of ice at the Antarctic Pole.

REMEDY FOR CALF SCOUR.

The Maryland Experiment Station, after testing formalin for calf scour, announces that it has found 1 part of formalin in 4,000 parts of milk will almost invariably destroy the organisms existing in the bowels of the calf, which are responsible for scour. Dissolve ½-oz. of formalin in 15½ oz. of water, and add a teaspoonful of this liquid to each lb. of milk fed to the calf.

WOMAN'S RIGHTS IN FRANCE.

For fourteen years women in France have been working to get married women the control of their earnings. A Bill to grant them this right has reached the second reading, and it is believed that success is in sight. As things are now, if a married woman earns a dollar in washing, or 1,000 dollars by writing a successful novel, every cent of it belongs to her husband. If she secures the money and puts it in the bank, she cannot draw it out without an order from him, but he can draw it and spend it as he pleases.

HOW TO GET RID OF BURR.

Burrs are annuals, and should be pulled up or mown down before they mature their seeds. If farmers would do this, they would get rid of the burr plants in a single year. The trouble, however, lies in the carelessness of some farmers and also of some local authorities. One man may clean his land, but, owing to burrs being carried about by farm animals, dogs, &c., and to their being constantly brought from infested districts by flood waters, unless a general combined effort be made throughout an entire district, the careful farmer will always have the work to do over again. The main point, however, is to destroy the plant before the seed matures.

RINGBARKING.

We had occasion a little while ago to visit a selection the owner of which stated that 50 acres had been ringbarked. On reaching the place, we found hundreds of large dead trees, but the land, so far from being clear, was a dense mass of tall undergrowth, consisting of suckers from the roots of the larger trees, and of wattle and other trees whose seeds, as is well known, lie dormant for years until favourable conditions enable them to germinate and quickly encumber the land with a dense scrubby growth.

We are often asked: "What is the proper time for ringbarking?" The well-known botanist, Mr. J. H. Maiden, Government Botanist and Director of the Botanic Gardens in Sydney, says: "So diverse are local conditions that it is impossible to prescribe with exactness the time for destroying trees in every district. When a man asks us the best time to ringbark a certain tree, we have frequently no precedent to offer him. Because stringybark was successfully ringbarked in September, 1889, it does not follow that box may be successfully ringbarked at the same or at any other place in September, 1897. If we could prepare a column of statistics in this way . . . what a boon it would be! . . . . We must consider the tree as a living organism, and give some attention to the physiology of tree-growth.

"The first thing is to ascertain when the sap is 'up' (to use a rather loose phrase, the meaning of which is, however, well understood), evidence of which is shown by the facility with which the bark strips, and also by the formation of the leaves, to be noted at a distance by their greater greenness. Starch is contained in the sap of a tree. This starch is separated from the sap and stored up during the period of active growth in the wood, and especially in the root wood, ready for the formation of buds (usually leaf buds), which buds usually burst in the spring, but the season of bursting forth is exceedingly variable in this State (New South Wales) with various trees.

"Now, many trees, if the bark be injured or ringbarked, have the power of developing the latest buds which exist under the bark, which buds are developed, as above stated, in the root wood and in the stump. In other words, we have "suckers," those curses of the forester and pastoralist. . . . The liability of box to sucker has passed into a byword. So here, I think, we have the key to the problem of ringbarking. If a tree is to be rung, see that

the work is done properly—right through the cambium layer all round. Then see that it is cut at a period when the particular kind of tree operated upon has little or no starch or bud-sustaining material left in its roots. In other words, see that it is cut off from its base of supplies. . . . Ringbarking is, in fact, an operation requiring scientific direction, and no land-owner should turn a number of men indiscriminately into his property to ringbark without very cautiously directing their operations."

From the above, which we have taken from the "Agricultural Gazette of New South Wales" (3rd October, 1904), it will be gathered that different trees have their different seasons of growth, and that, consequently, whilst in a large paddock which has been ringbarked, whilst, say, all the ironbarks are completely killed, the box-trees will throw up suckers, and it is the same with many other trees.

Our own personal experience lies in the direction of felling and burning off a large area of forest country, a few miles from Brisbane, for the purpose of growing sisal hemp. In the spring, almost every tree stump sent out numerous healthy suckers. These were allowed to grow to a height of about 3 feet, when the land was brushed clean. In the following season a smaller growth occurred, which was also destroyed. Within three years the whole of the stumps and roots were dead, and no more suckers appear except occasionally here and there. Plants breathe through their leaves; therefore, the persistent destruction of these can have but one result—the trees or stumps must die. As to stating any particular time when general ringbarking should be done, all we can say is—the best time is when the sap is "up." But, as Mr. Maiden points out, owing to the diverse local conditions and the diverse habits of our forest trees, he would be an unwise man who would authoritatively name a certain season for ringbarking all trees. It should be a matter for close observation on the part of the land-owner.

QUEENSLAND AGRICULTURAL COLLEGE EX-STUDENTS' CLUB.

The Annual Dinner.

The annual dinner of the members of the Queensland Agricultural College Ex-students' Club took place on the evening of Thursday, 15th August, at the Café Eschenhagen.

There were present:—Mr. John Mahon, Principal of the College, in the chair; Messrs. E. G. E. Scriven, J. P. Orr, H. C. Quodling, W. H. Mobsby, C. Ross, J. F. Bailey, J. Liverseed, G. B. Brookes, and about forty ex-students.

Apologies were read from the President of the Legislative Council, Sir Arthur Morgan; the Premier and members of the Ministry, and from several invited guests and ex-students; also from Major A. J. Boyd, the hon. secretary, who was unavoidably absent owing to illness.

The Chairman proposed the health of "The King," which was drunk with musical honours. He then gave a slight sketch of the past history of the college, and alluded feelingly to the deaths of Mrs. Peter McLean—the good wife of a good man—and of Mrs. Norman Philp.

Mr. H. B. Corser proposed the toast of "The Ministry," which was acknowledged in a very humorous speech by Mr. Orr.

Mr. Nuttall, manager of the Rockhampton Butter Factory, an ex-student, proposed "The Agricultural Department." In the absence of the Minister, who was at Government House, and of the Under Secretary, who was called away, Mr. Mahon suitably responded. In doing so, he pointed out that the Queensland Agricultural College was certainly not behind similar institutions in the South. It was well up to date, and, if anything, was well ahead of other agricultural colleges in Australia. He expressed regret at the apathy of the old students in not being present in larger numbers, and hoped that the club would go ahead during the coming year and increase in numbers and in energy.

He touched on the great saving to the farmer by means of the experiments carried out at the college to find out what was good for the farmer and what the reverse. When a crop was found by the department to be a failure, it saved the farmer from losing his money; on the other hand, when it was found to be a success, the farmer knew that he could go "full speed ahead."

Mr. Quodling proposed "The Ex-students' Club." He asked that greater numbers should join, and pointed out the great advantages to be derived from ex-students banding themselves together for their mutual benefit, not only in social life, but also in helping each other in the battle of life to overcome difficulties and tide over troublesome times. Their association would, in after life, be fraught with pleasant recollections, and many of them would be brought together perhaps in other lands by the mutual tie of their college companionship.

Mr. Webb made a capital speech on the excellence and value of the Exhibition, and said that the "boys" should make a grand effort next year to send down a good trophy, each from his own district, and scoop in the £5 5s. so generously promised by Mr. Mahon for the best exhibit by ex-students.

Other speakers were ex-students Rochat, Devereaux, Dixon, Binnie, Murray-Prior, Wilkie, and Corser. The latter feelingly voiced the deep sympathy of the members with Messrs. McLean and N. Philp in their grief. Motions of condolence were passed, and the secretary was instructed to write to these gentlemen accordingly.

Mr. Dixon proposed the health of "Mr. and Mrs. J. Mahon, and of the little Mahons." The toast was vociferously honoured with a "three times three." Mr. Mahon suitably acknowledged the compliment.

The toast of "The Press" was proposed by Mr. Orr in one of his usual witty speeches. Mr. Lavers, of the "Courier," and Mr. Mackay, of the "Daily Mail," briefly responded.

Messrs. Brookes, Bailey, and Mobsby also said a few words on the success of the meeting, on the successes of the students, and on the good work being done by those students who had passed out of the college and had entered upon the business of life for themselves with so much energy and determination.

Q.A.C. EX-STUDENTS' CLUB.

Subscription received 10th September: H. Talty, 5s.

TWIN FOALS.

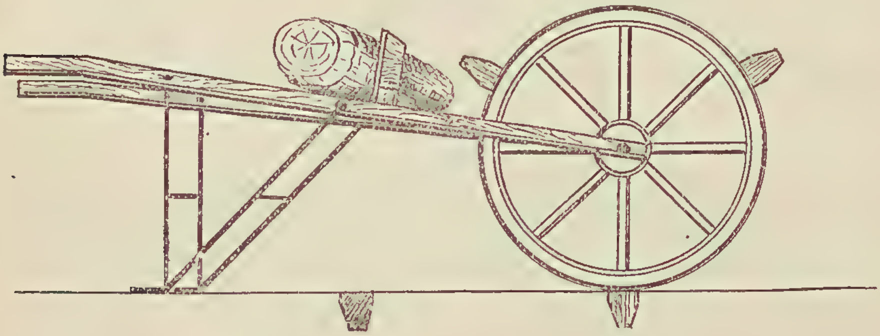
According to the statistics collected in 1900 by Mons. Cornevin (says the "Live Stock Journal"), twin foals are thrown in about one case in a thousand. A curious instance of twins was recorded by Mons. Porcherel. A cart mare getting loose after service by a stallion was covered by a donkey on the same day. The mare went her full period, and produced twins, both females—one a filly, the other a mule. The two were healthy, well-formed animals, and, growing up, were sold for £16 and £12 respectively.

THE USE OF CARAVONICA COTTON SPREADING.

The cultivation of Caravonica cotton is to be undertaken on an extensive scale in Egypt, and much of the area which will be brought under irrigation by the 23-feet addition to the Assouan dam, spoken of in the April issue of "Tropical Life," will doubtless be utilised in its cultivation. Dr. Thomatis, the originator of this variety of cotton, tells us that a Caravonica Association has been formed for Egypt and the Sudan, and asks to be given the monopoly of the supply of seed. Dr. Thomatis cabled the terms upon which he was prepared to treat, and these being accepted by the association the first supply of seed has been ordered. A gentleman in America has almost decided to undertake a similar monopoly for the two Americas and the West Indies.—"Tropical Life."

AN INGENIOUS TOBACCO MARKER.

Mr. R. S. Nevill writes:—I herewith submit the design of an ingenious marker for use in transplanting tobacco, suggested by Mr. Joseph Butler, of Cardwell. The wheel is 54 inches in circumference, with three blocks attached, 18 inches apart. These blocks make indentations in the ground to show where the plant is to be set. Stakes are set at each end of the field, and the marker is



rolled—wheelbarrow fashion—to the stakes, thus ensuring straight rows and that the tobacco is set out at equal distances apart. It is especially adapted to small fields. Any farmer handy with tools can make one, and it is much better than ropes stretched across, with strings tied to mark the place where the plant is to go.

EXPORT OF EGGS.

The Department, to test the English market for Queensland eggs, is prepared, if sufficient inducement is forthcoming, to receive on owner's account, eggs for export, subject to the following conditions:—

1. Eggs to be delivered, freight paid to Brisbane, during October. Orient steamer leaves 26th October.
2. Not less than twenty dozen will be received from any one person.
3. All charges for receiving, storing, packing, and freight, &c., to be charged against proceeds.
4. Eggs to be not less than 2 oz. in weight and to be fresh and clean.
5. If infertile eggs are sent, owner to sign guarantee to that effect.
6. The Department will advance up to 75 per cent. of the market price ruling at Brisbane at the time of shipment.
7. The Department reserves the right of rejecting eggs not up to standard, and will not be responsible for breakages. All rejected eggs, if saleable, will be sold in market on owner's account.
8. The Department, in order that arrangements may be made, requests that those intending to participate shall duly notify their intentions.
9. All communications to be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	SEPTEMBER. Prices.
Apples, Eating, Local, per packer	4s. 6d. to 8s.
Apples, Cooking, Local, per packer	4s. to 7s. 6d.
Apricots, Local, per packer	...
Bananas, Local, per dozen	...
Bananas, Local, per bunch	6d. to 1s.
Bananas, Fiji, per case	...
Custard Apples, per quarter-case	2s. 6d. to 4s.
Cape Gooseberries, per quarter-case	4s. to 6s.
Grapes, per lb.	...
Lemons, Local, per packer	2s. 6d. to 4s.
Mandarins, Local, per packer	2s. to 6s.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges, per packer	1s. 6d. to 3s. 6d.
Papaw Apples, per case	...
Passion Fruit, per quarter-case	...
Peaches, per case	...
Peanuts, per lb.	$2\frac{1}{2}$d. to $2\frac{3}{4}$d.
Pears, Imported, per case	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	4d. to 1s.
Pineapples (smooth leaf), per dozen	9d. to 2s.
Plums, quarter-case	...
Quinces, per case	...
Rockmelons, per dozen	...
Rosellas, per bag	1s. to 1s. 3d.
,, per quarter-case	6d. to 9d.
Strawberries, per tray	...
Tomatoes, per quarter-case	2s. 6d. to 3s. 6d.
Watermelons, per dozen	...

SOUTHERN FRUIT MARKET.

Article.	Prices.
Apples, Tasmanian, per case	...
,, Other, per bushel case	...
Bananas, Fiji, per case	15s. to 16s. 6d.
,, ,, per bunch	11s. 6d.
,, Queensland, per case	6s. to 8s.
,, ,, per bunch	4s. to 6s.
Chillies, per bushel	...
Grapes, per box	...
Lemons, Ordinary, per gin case	...
Loquats, per box	7s. 6d.
Mandarins, Queensland, in Melbourne, per case	7s. to 8s.
Oranges, Queensland, per case	3s. 6d. to 4s. 6d.
Oranges, Queensland, in Melbourne, per case	7s. 6d. to 8s. 6d.
Oranges, Navels, Queensland, in Melbourne, per case	9s. to 10s.
Pears, Victorian Vicars, per box	...
Persimmons, per half-case	...
Pineapples, per case	2s. 6d. to 5s.
Passion Fruit, per gin case	2s. 6d. to 3s. 6d.
Quinces, per gin case	...
Strawberries, per dozen punnets	...
Tomatoes, Queensland (coloured), per gin case	3s. 6d. to 4s. 6d.
,, ,, (green) ,,	1s. to 2s.
Watermelons, Queensland, per dozen	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR SEPTEMBER.

Article.		SEPTEMBER. Prices.
Bacon (Pineapple) ...	lb.	10d.
Barley (Malting) ...	...	...
Bran ...	ton	£4 15s.
Butter, Factory ...	lb.	11d.
Chaff, Mixed ...	cwt.	3s. 3d. to 4s. 9d.
Chaff, Oaten ...	ton	£4 10s.
Chaff, Lucerne ...	,,	£4 to £7 5s. 6d.
Chaff, Wheaten ...	cwt.	2s. 3d. to 2s. 9d.
Cheese ...	lb.	7½d.
Flour ...	ton	£9 10s.
Hay, Oaten ...	,,	£5 12s. 6d. to £5 15s.
Hay, Lucerne ...	,,	£4 10s. to £6
Honey ...	lb.	2d. to 2¼d.
Maize ...	bush.	2s. 11d. to 3s.
Oats ...	,,	3s. 8d.
Pollard ...	ton	£5 5s.
Potatoes ...	,,	£2 15s. to £5 10s.
Potatoes (Sweet) ...	,,	...
Pumpkins ...	,,	...
Wheat, Milling ...	bush.	3s. 3d. to 3s. 9d.
Wheat, Chick ...	,,	...
Onions ...	ton	£4 15s.
Hams ...	lb.	1s. 1d.
Eggs ...	doz.	5¼d. to 7d.
Fowls ...	pair	2s. 2½d. to 3s. 9d.
Geese ...	,,	...
Ducks, English ...	,,	3s. to 3s. 6d.
Ducks, Muscovy ...	,,	3s. 3d. to 4s. 3d.
Turkeys, Hens ...	,,	5s. 7d. to 6s. 9d.
Turkeys, Gobblers ...	,,	9s. 9d. to 14s.

ENOGGERA SALEYARDS.

Animal.	AUGUST. Prices.
Bullocks ...	£9 15s. to £11 5s.
Cows ...	£7 10s. to £11 5s.
Merino Wethers ...	25s. 6d.
C.B. ,, ...	23s.
Merino Ewes ...	20s.
C.B. ,, ...	24s. 6d.
Lambs ...	15s. 3d.
,, (Extra) ...	19s. 6d.
Pigs (Porkers) ...	28s. 6d.
,, (Slips) ...	3s. 6d.

EXHIBITION.

Animal.	AUGUST. Prices.
Bullock, Champion ...	£22
Cows ...	£12 10s.
Bullock, Guessing ...	£22
Merino Wethers ...	29s.
,, Ewes ...	22s. 6d.
C.B. Wethers ...	40s.
,, Ewes ...	43s.
Lambs ...	19s.

Farm and Garden Notes for November.

Field.—Under ordinarily favourable conditions harvesting the wheat and barley crops may now begin. Those who have oats for hay should cut it when the grain has formed, but before it is ripe, for then the plant is in its most nourishing condition. Destroy caterpillars on tobacco plants, and top the latter so as to throw all the strength into the leaves. Keep down the weeds, which will now try to make headway. Earth up any growing crops requiring the operation. Sow maize, imphee, setaria, kafir corn, teosinte, sorghum, &c. Plant sweet potatoes, sisal hemp, yams, peanuts, and ginger.

Kitchen Garden.—Why do so few gardeners and farmers grow their own vegetables? This is a question frequently asked by visitors to the farming districts. The reason probably is that vegetables require a good deal of care and attention, which means also a good deal of time taken from the ordinary farm work. In many cases it pays the farmer better to buy many kinds of vegetables than to grow them himself. The only vegetables grown on many fine farms are cabbages and pumpkins, not to class potatoes under the head. Many people have an idea that European vegetables cannot be grown during the hot summer months, but this is a great fallacy; the Chinese gardeners supply the town with all kinds of vegetables except, perhaps, cauliflowers, during the whole of the summer. It is, therefore, clear that, by constant work, plenty of manure, water, and some shade for seedlings, most vegetables can be produced during the hot months from November to March. If your ground has been trenched or deeply dug and well worked, the advantages will be seen during the coming months. It does not pay to work shallow-dug ground. When sowing and planting during this month, give plenty of room between the rows and the plants, otherwise they will be drawn up and worthless, and keep the ground open by constant forking and hoeing. Thin out melon and cucumber plants. It is a good plan to peg down the vines; they will then not be blown about by the wind; they will take root at intervals, and thus help the main stalk. Give plenty of water to tomatoes planted out last month. They should also be mulched. Sow cabbage, French beans, melons, lettuce, radishes, pumpkins, cucumbers, marrows, rosellas, &c., and transplant for succession in calm, cloudy weather.

Flower Garden.—Stake any dahlias which may be now above ground, and plant out the bulbs which were stored in a moist place. If the weaker bulbs are reserved, they will come in for autumn planting. Take up all bulbs which have done flowering, and store them in a dry place. Winter-flowering plants will have gone off almost, still the garden should be in full bloom, and will well repay the trouble bestowed on it; and a little fertiliser given as a top-dressing will assist the plants to bloom and look well for a longer time than if they were neglected. Give weak liquid manure to chrysanthemums, and allow no suckers to grow till the plants have done flowering. Take up narcissus. Do not store them, but plant them at once in new situations. Sow antirrhinum, balsam, zinnia, summer chrysanthemum, calliopsis, and nemophila.

Orchard Notes for November.

By ALBERT H. BENSON.

The earliest varieties of summer fruits will be ready to market during November; and, as this is the beginning of the season, I beg to call the special attention of every fruitgrower in the State to the importance of gathering and destroying all fly-infested fruits now if he wants to save any crop at all, as the neglect to destroy the first crop of flies will result in the loss of the succeeding crops of fruit. It is impossible to over-estimate the importance of destroying the early crops of fruit flies, as if left alone they breed so rapidly that the fruit crop is soon infested and destroyed.

The best way of destroying the first crops of flies is to gather and boil all infected fruit; such fruit, when boiled, to be fed to pigs or other animals. Feeding the fruit without boiling will result in the escape of a number of the maggots, and is therefore undesirable, besides being contrary to the Regulations of the Diseases in Plants Act.

During the month, the orchard should be kept well cultivated, especially in districts where the rainfall is light; and in such districts, if water is available for irrigation, a good watering should be given to all fruit trees and vines. By a good watering I don't mean damping the surface, but giving the soil a thorough soaking, as one good watering is worth a dozen small ones. Attend to the summer pruning of all young trees, removing any superfluous branches and pinching back all strong growths. Attend to the cultivation of the nursery; stake all grafts or buds, so as to produce straight, well-grown trees, the bud or graft being topped at the height that it is wished to form the head of the future tree.

Agriculture.

QUEENSLAND INDUSTRIES.

By A. J. BOYD.

No. 1.—MARKET-GARDENING.

Amongst what may be called the minor industries of the State, market-gardening holds an important place, although it is not nearly so extensively carried on here as a separate business as it is in the Southern States. This may be accounted for, in the first place, by the sparseness of the population; next, by the fact that in the neighbourhood of the towns all over the State Chinese gardeners have almost monopolised the business; and, thirdly, that the white farmer prefers what may be called wholesale farming to attending to the details of vegetable and small fruit growing, however ready a sale may be found for such produce, especially to that very important detail, irrigation, which is very rarely adopted, at any event by farmers in the Southern portions of the State. Vegetables require to be frequently and copiously watered, but without some system of irrigation by gravitation the labour entailed by the necessity for carrying water in cans does not appear to the average farmer to be compensated for by the pecuniary results. In the North—as, for instance, at Bowen—where most of the farms and orchards are irrigated, market-gardening is practised on a large scale, and there it has proved most remunerative to the farmers and fruit-growers, who raise abundant crops of vegetables, especially of cucumbers and tomatoes, of which thousands of cases are sent to the Southern markets weekly by the coasting steamers. When we look round some of the small farms in the neighbourhood of Southern towns, we cannot fail to be surprised at the apathy displayed in carrying on so interesting and remunerative a business. We must say that the German farmers are far ahead of us in this respect. Whenever one travels into the farming districts or round the suburbs of the towns, and sees a pretty, well-cared-for garden, always with a few vines on stakes or trellises and well-stocked beds of vegetables, it is always safe to say: "That place belongs to a German."

With ordinary common sense, almost any kind of soil can be converted into a good garden for the growing of vegetables and fruit. The main requisites are manure, water, and thorough cultivation. With these, there are few acres of Queensland soil on which a crop of vegetables may not be raised. There are seasons now and then during which the rain comes just at the right times and water may not even once be required to be supplied artificially, but such seasons are rare. Usually there are several dry spells during each year that cause serious injury to crops. A very little water at the right time will make all the difference with a crop, and turn into success what otherwise would have been a partial or total failure. It would not be reasonable to expect that any of the many systems of irrigation can be applied to all sections of the State, or even to every farm in any given district; but where there is, or where there may be created, a supply of water which can be drawn on in case of need, it is a great mistake not to make use of its benefits, for where this is done the market-gardener may be fairly assured of success. There are certain crops, such as asparagus, celery, strawberries, which need an amount of water that is not required by most others, and which could be grown much more cheaply than at present if aided by irrigation. We can show what large returns have been obtained from a small but intensely cultivated vegetable garden, where a regular water supply was provided. This matter of irrigation is of the first importance; the supply of manure comes next. Manure can be obtained in various ways, such as from city and country stables, from the pig and fowl yard.

Nightsoil properly prepared by admixture of dry earth can also be utilised. Again, there is the compost heap, which will absorb all the waste products of the house, the yard, and the garden itself, and which, if properly treated, will furnish an abundant supply of rich plant food. This question of manures, however, I shall deal with at length later on.

There is one matter to which some market-gardeners give too little attention, and that is to the "get up" of the produce before marketing. Everyone knows that manufacturers all over the world vie with each other in marketing their goods in the most attractive form, as they know from experience that, although one case of goods may be equally good as another, yet if one is marketed in an unattractive manner it will bring a lower price than that in which care and art have been employed to render it more pleasing to the eye. As with manufactures, so it is with fruits and vegetables. Market them in an attractive, fresh-looking condition—market them honestly, not placing the best on top of case, basket, or bag, but letting the whole be equal to the part—and you are sure to capture and retain your customers. There is more in this matter of "get up" in the marketing of vegetables and fruits than many growers are aware of.

In summarising what I have briefly set forth here, I would point out that the multiplication of market gardens and the employment of irrigation mean better economic conditions. It means the occupation of small holdings, consequently more homes and greater comforts for men of moderate means. It means more intelligence and knowledge applied to farming; more intense culture; more profit from crops. It means association in urban life instead of isolated farms, and hence more village settlement, more churches, more schools, a higher standard of living and morality. Finally, to quote Lucius M. Wilcox, editor of "Field and Farm," in his work on "Irrigation Farming," it means more telephones, telegraphs, good roads, and swift motors; fruit and garden growths everywhere; and such general prosperity as can hardly be dreamed of by those who are not familiar with the results of even the present infancy of irrigation in America. It can hardly be doubted that, in time, the lessons conveyed by history as well as by the daily practice and results of irrigation in arid and semi-arid —aye, even in humid regions—will induce the dwellers in the regions of summer rains to procure for themselves at least a part of the advantages which are equally within their reach, putting an end to the dreadful seasons when "the skies are as brass and the earth as a stone" and the labours of the husbandman are in vain.

Starting the Garden.

In selecting the site of a vegetable or flower garden, there are four essential points to be considered—viz., water, soil, aspect, and shelter. Another point to be remembered is that, in growing garden stuff for sale, there is also the question of convenience to rail and market to be taken into consideration. In the early days of Queensland, some forty-five years ago, when the rich scrub lands bordering the Brisbane River were first occupied by farmers, market-gardening was carried on on a fairly large scale by all of them, and all produce was brought to Brisbane or to Ipswich by market boats. Vegetables, in those days, brought far higher prices than they do now, and every tide brought down scores of boats carrying from 1 to 5 tons of garden produce, which found a ready sale at the market wharves. It was no uncommon sight to see 5 tons of cabbages landed from a single boat, and disposed of in ten minutes to the dealers attending these open-air markets.

To continue: I have placed water first on my list of essentials because, as I have already pointed out, to attain any degree of success in market-gardening a good supply of water is an absolute necessity. As a rule, the best situation for a garden is on the bank of a creek or near a lagoon or waterhole; but, if none of these are available, the alternative is to sink a well or make a dam, *for water you must have.*

True, there may be months and months during which no watering will be required, but it is quite certain that sooner or later a dry spell will come, often in August and September, when most vegetables should be vigorously growing, and if you have no supply you will probably lose the result of months of labour. Therefore, whether your garden consists of 20 acres or 20 perches, be certain that the water supply will keep it going at all seasons of the year.

Now, as to soil—

The Soil.

You may rest assured that you cannot have too rich a soil for gardening. But, at the same time, if a very rich soil be unobtainable, it is very easy to make it rich by a liberal and judicious use of manures; and it must be made very rich if you are to have success in growing cabbages and cauliflowers.

The deep alluvial flats commonly found near the banks of many of our creeks and rivers are ideal soils for this class of produce, being usually very rich in humus—that is, in the organic portion of the soil—resulting from decayed vegetable matter. (A good example of humus is well-rotted leaf mould.) Such a soil contains all the elements necessary to produce high-class vegetable crops. A light, sandy loam is better for such crops as onions, carrots, &c.; but, as it is not always possible to get several kinds of soil within the limits of a garden, it follows that the soil must be made, as far as practicable, to suit each different crop by varying methods of treatment and manuring.

In locating the garden, it is well not to have it too far from the dwelling; in fact, if the house is *in* the garden, so much the better.

As to aspect, if the garden is on a slope, the fall should be to the east; but a level site is preferable, as level ground can be more easily and economically worked than a slope, and there is not the danger of both soil and crop being washed away during heavy rains, or of the valuable soluble portions of manure, where applied, leaching out, which effects are always to be feared in a garden located on a hillside. Then, if possible, the garden should be protected against heavy winds by a ridge or belt of timber.

In clearing scrub lands for a garden, it is advisable to leave a belt of trees standing on the side from which the prevailing winds blow. This belt should be 2 or 3 chains wide, and not sufficiently close to the garden to interfere with the free access of light and air to the plants.

If no natural shelter exists, a belt of camphor laurels, silky oaks, or loquats should be planted on the exposed side.

Preparing the Land.

In preparing the land for gardening, I recommend deep working to begin with. Get down 15 or 18 inches if you can. If you use horse implements, break up the subsoil with a subsoil plough, but be careful not to bring the subsoil to the surface. The advantage of this deep working will be chiefly apparent in a long spell of dry weather, when plants in deep soil will be found to grow and thrive, while others in shallow soils will require constant care and watering to keep them alive. Should the ground be very level or wet in places, such parts should be drained either by means of surface drains or by one of the cheap methods of under-draining. The land being thoroughly broken up and brought to a fine tilth, the next step is to mark it off in sections for various kinds of vegetables, fruits, &c.

If the garden is small and horses are not used, then a lesson may be learned from the Chinese gardeners, and that is, to make the beds of such a width as to obviate the necessity of trampling on them when weeding or transplanting. Very narrow pathways between the beds will suffice to give access to them, so that not much space is lost in this manner. But no hard-and-fast rule can be laid down. It is all a matter of convenience and circumstances, but always bear in mind that, even in a small garden, horse labour is cheaper than hand labour; therefore, arrange things in such a manner that as much of the work as possible may be done by means of horses.

I may here say: Never sow garden crops of any kind *broadcast*. This is an obsolete custom, which, in view of the means now provided for sowing seeds by seed-saving implements, should have been done away with long ago.

Always sow in rows, and have the rows far enough apart to enable you to use either horse or hand cultivators between them. By following this system it is easy to keep the ground clean, and also to keep it open, and conserve the moisture by cultivation—a thing which cannot be done where crops are sown broadcast.

This broadcasting of garden crops cannot be too strongly condemned, as it is wasteful, untidy, and unprofitable, except to the seed-sellers, who are the only people who benefit much by it.

The Kind of Seeds to Sow.

Having prepared the soil and decided upon what to grow, and marked out the ground in sections for the different crops, the next most important question is that of

Seeds.

Seeds, to be profitable, must be of first-class quality, and it is cheaper in the long run to pay a good price for good seeds than to buy inferior rubbish, which is dear at any price. Always purchase your seeds from a reliable seedsman, who has his reputation to maintain, and who can be depended upon to send out only seed of good germinating power and free from mixtures of any kind other than the variety of which the name appears on each packet. Some kinds of seeds retain their germinating power unimpaired for several years—cabbage and turnip seeds, for instance, and cucumbers, melons, &c. Old cucumber seed, as a matter of fact, is to be preferred to new. Other seeds, such as onions, carrots, and parsnips, are of very little use when more than a year old. Peas, beans, &c., are also at their best during the first season.

In making a choice of the kinds of vegetables to grow, do not be misled by glowing descriptions of certain kinds. You will find it far more satisfactory to buy standard varieties or good market sorts. Study what your neighbour has been doing, and get from him the names of any varieties which he has grown most successfully. By this means you will be able to get something worth planting, and be saved both expense and annoyance.

It is well to suit your selection of varieties to the climate. Many farmers attribute their failure to being swindled by the seedsman, when really they themselves are to blame, by trying to grow varieties unsuited either to the soil or the climate. Take, for instance, Brussels sprouts. They can certainly be grown in some districts below the Range, but at best they will be imperfect, whereas in the colder districts above the Range they thrive well.

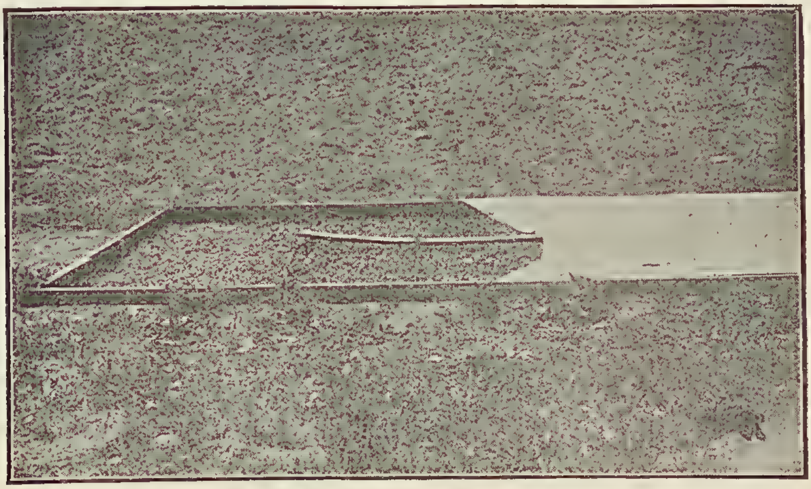
Sowing the Seeds.

The late Mr. H. W. Gorrie, when horticulturist at the Gatton Agricultural College, was a master of the art of cottage-gardening, and it is to his writings on the subject in the "Queensland Agricultural Journal," most of which are here reproduced, that I am indebted for the most valuable information on market-gardening.

Some kinds of vegetable seeds are sown in seed-beds, and when large enough, transplanted to the open ground; others are sown directly in their permanent places. For a seed-bed, I know of nothing better than the plan recommended by Mr. Nevill for raising young tobacco plants. A full description and illustration of this form of seed-bed appeared in Vol. II., Part 3 (March, 1898), of the Journal, and I can confidently advise its adoption for raising young plants of any kind.

Cabbages, cauliflowers, lettuce, tomatoes, and numerous other kinds are always raised in seed-beds; and it will be found better to sow these all in narrow shallow drills in the bed than to sow broadcast. Young plants grown

in drills are much easier to lift and transplant than if broadcasted, and as a rule are stronger and sturdier. In preparing the bed, the soil should be raked as finely as possible, and the seeds must not be sown too deeply. A quarter to



a half inch of soil above the seed is usually enough. If the drills are covered in with a little very fine and thoroughly rotten manure, germination takes place quickly, and in transplanting a ball of the manure will stick to the rootlets, thus increasing the chances of success in planting.

In preparing soil for seed-sowing in the open ground, always have the soil thoroughly tilled, cleaned from weeds, and well pulverised. An Acme harrow immediately following the plough will reduce most soil to a very fine tilth; and if not, the rake must be used to finish off, especially with such seeds as carrots, onions, &c.

Where enough ground is available, I should recommend sowing all such crops as these in drills from 2 to 3 feet apart, so that horse cultivators can be used among them.

However, this subject will be more closely gone into when dealing with crops in detail.

Transplanting.

For transplanting, the ground should be prepared, more especially for delicate plants, in precisely the same way as for seed-sowing. The finer the surface soil is, the more easily will the young tender rootlets be able to force their way down in search of food and sustenance; and as a consequence leaf growth will necessarily follow.

If the soil is hard and lumpy, the attempt of the rootlets to strike into it becomes to some extent useless, and it naturally follows that the top growth also becomes retarded, and it will only be by good luck if the plants come to anything. When taking the plants from the seed-bed, be careful not to break the roots too much, and endeavour to lift them with a little of the soil adhering. Never pull young plants up, but lift them carefully. It is a good plan to give the bed a thorough soaking with water some time before beginning to lift the plants.

Always, if possible, choose a dull or showery day for transplanting; but, should the weather be warm and dry, do the work in the afternoons, and water well after planting; and if suitable material is procurable, mulch the ground for a few inches round each plant. Set the plants a little deeper in the ground than they were in the bed, and firm the soil well around the roots without bruising the necks of the plants.

Take care always to make the hole for planting just deep enough, so that the plant will not *hang* in it, and give the plants plenty of room to grow, by setting them a little wider in the rows than the size of the plants when fully grown.

For example, if a cabbage will cover 2½ feet on the outside leaves, set the young plants of that variety out 3 feet apart each way.

Should the weather be dry for some time after planting, it will be necessary to water the young plants several times a week until they become established; the watering being done either early in the morning or late in the afternoon.

A great deal of watering and hoeing will, however, be saved if *mulch* is used as already advised. The importance of mulching cannot be over-estimated. Almost anything will do—stable manure, grass, or litter of any kind, provided it can be easily and conveniently placed around the plants. Mulching prevents the ground from baking after watering, and so saves hoeing; and it also helps to arrest evaporation, thus saving watering; and also it tends to keep the temperature of the surface soil equable, and so tends to promote healthy and vigorous root-action. I confidently recommend mulching for any kind of vegetable crops which require transplanting, and am sure that the grower who tries it once will never give it up again so long as he aims to get the best possible results from his work with as little labour as possible.

In my next I shall deal with the methods of raising cabbages and cauliflowers.

UNDESIRABLE SEDIMENTS IN IRRIGATION WATER.

Analyses of the sediments carried by the Gila, Salt, and Colorado Rivers, in Arizona, have shown that the Gila carries on an average 19·23 tons of sediment per acre-foot of water; the Salt River, 1·2 tons; the Colorado, 9·62 tons. These amounts, however, vary very widely at different times. The amounts stated would furnish, on the average, 214 lb. of potash per acre, annually, 37 lb. of phosphoric acid, and 28 lb. of nitrogen, in the case of the Gila River; 18 lb. potash, 6·6 lb. phosphoric acid, and 5·5 lb. nitrogen in case of Salt River; and 113 lb. potash, 10 lb. phosphoric acid, and 4·8 lb. nitrogen in case of the Colorado River. These facts merely serve to give definite form to the knowledge, as old as human history, that river irrigating sediments increase the productiveness of the land. The varying values shown in our South-western (U.S.A.) river sediments call to mind the parallel fact known in Egypt since ancient times, that the Red Nile floods from Abyssinia are more valuable than those from other watersheds tributary to that river. The calculations, however, are based upon the assumption that all of the sediment reaches the irrigated fields, but by no means all of the sediments are carried upon irrigated fields. With gentler gradients and slackening motion of the water, the heavier portions are soon dropped in canals and laterals, neccessitating the never-ending work of ditch cleaning. The remaining lighter portions are carried upon irrigated ground where, with still further decrease in the movement of the water, the residual solids are deposited in large part near the point of diversion from the supply ditch. In considering the effects of sediments upon lands, therefore, it is necessary to allow for the manner in which they are distributed, this distribution being affected by the kind of crop, the method of irrigation, and the slope, as well as by the fineness of the sediments themselves. While it is caululated, cherefore, that 4 average acre-feet of Colorado River water at Yuma carry sediment enough to make a layer of soil about one-fourth of an inch thick each year, the larger portion of this amount is actually concentrated upon probably much less than half of the ground irrigated. Rising ditch banks and increasing gradients in *irrigated* fields under muddy streams attest the activity of this factor, and suggest that in this region in time to come the disposal of ditch cleanings and field deposits may become a serious problem.

UNDESIRABLE SEDIMENTS.

While the fertilising value of these sediments is undoubted, the results of their accumulation on irrigated soils are often decidedly injurious. Irrigating sediments may be beneficial or harmful to crops according to their composition and physical character and their disposition in or upon the soil. Whether beneficial or harmful in composition, if they accumulate upon the surface of the soil in the form of silt blankets more or less impervious to water and air, their influence, by limiting the supply of these essential substances to plant roots, is notably harmful. In certain localities where these irrigating sediments are very plastic in character and excessive in amount, the damage, particularly to alfalfa and other crops which cannot receive constant and thorough cultivation, is of an increasingly serious character. Cultivation, where practicable, as deep and thorough as possible is the best available means of handling these accumulations. Beneficial sediments are thus incorporated with the soil and their fertilising properties made available to plant roots, while sediments of barren character are dispersed to the depth of cultivation through the soil. When, however, sediments of undesirable character predominate, cultivation can only modify and not remedy resulting conditions. In such cases it is desirable to lessen the sediments in irrigation waters by means of settling basins and similar devices.—"Indian Trade Journal."

TRAP CROP FOR THE COTTON BOLL WORM.

The "Bulletin of the Imperial Institute" (Vol. V., No. 2) publishes a very interesting account of cotton insect and other pests, and the methods suggested for their destruction, prepared by Mr. Gerald C. Dudgeon, Superintendent of Agriculture for British West African Colonies and Protectorates. The account is based on papers which have appeared in the "Indian Museum Notes" for the past fifteen years; also, on a treatise on the "Cotton Pests of Egypt," issued by the Khedival Agricultural Society at Cairo; and on papers published in the "West Indian Bulletin" of the Imperial Department of Agriculture. These notes are supplemented by others from Mr. Dudgeon's own reports on cotton in the United States, Egypt, the Sudan, and the West African colonies. Amongst many insect pests of cotton, one of the most serious is the cotton boll worm, which causes considerable damage to cotton in Queensland. The life history and method of destruction adopted by this worm are fully described, and then remedial measures are suggested, and here prominence is given to the adoption of trap crops, especially maize, between the rows of cotton. He says:—"The following system of planting maize trap crops has been very successful. Five rows are left vacant between every 25 rows of cotton, one of which, as soon as possible, is planted with early-maturing sweet maize. When the ear silk appears, careful examination is made for the eggs of the moth, and when no more fresh eggs are apparent the whole plant is cut down and burnt or fed to cattle. Three more rows of maize are then planted, so that the silking time of the ears comes on about the 1st of July (about December in Queensland). Upon these ears a large number of eggs will be found, and, in this case, they should be allowed to mature, in order to prevent the destruction of the natural enemies, which are parasitic on the eggs and the larvæ (caterpillars). The crowded condition of the worms on these ears induces cannibalism to such an extent that few reach maturity. No destruction of this corn is recommended until the whole generation has been parasitised, or, at most, the very small remainder have developed. The fifth and last row of maize is then planted to catch the eggs of the remaining few, and these are destroyed by burning the ear silk as soon as laying has apparently ceased. During the early stages of the boll worm it may be poisoned by applications of Paris green to the plants, but, owing to its habit of getting inside the boll, it is less easily destroyed in this way later.

Ploughing the ground in order to kill the pupæ is also resorted to, and often has beneficial effects. The use of lights, however, for the attraction of the moth, or of poisoned syrups for the same purpose, is not recommended, as by this means other insects are destroyed which may be harmless to the crops or even inimical to the boll worm. . . In West Africa, where cotton is being grown, the winter months have as high a temperature as the summer months, but there is a deficiency of food owing to the absence of moisture. During these long periods of dry, hot weather the generations of the boll worm are continued, but there is such a scarcity of food that the few individuals that survive to become moths are weak and dwarfed. For this reason there is little danger that the boll worm will ever become a serious pest in West Africa."

REWARD FOR PRICKLY PEAR DESTRUCTION.

The Government has now placed on offer a reward of £10,000 "for the discovery of an effective method of destroying prickly pear." The reward is not to be paid until the applicant has destroyed all the pear on the area selected by the Minister, and has shown that the cost has not been more than 35s. per acre for scrub land and 20s. per acre for plain or forest land. The work of destruction must be carried out in the presence of the Minister or an officer selected by him, and, if necessary, details of expenditure must be verified by statutory declaration. The Minister or his officer is to be entitled to test the specific or process upon any area of scrub, plain, or forest land selected by him, and, unless the Minister is satisfied that this area has been absolutely cleared by the process or specific at a cost within that stated, the reward is not to be payable. The Minister is to be sole judge whether the land operated on is scrub, plain, or forest. The pear will not be deemed to have been destroyed if it shows any sign of vitality within three months after operation. Before any reward shall be paid over, the applicant shall execute all such transfer of his rights in relation to the specific or process used in the operation as he can give and the Minister may require; and shall fully disclose all his title to such rights.

The "Agricultural Journal of the Cape of Good Hope" for August, 1907, says:—Last session (writes the late Director of Agriculture in his annual report for 1906) a Select Committee was appointed by the House of Assembly to consider the best means of preventing the spread and securing the destruction of prickly pear and jointed cactus, and of assisting farmers and others in this object. The committee brought up a report recommending compulsory extirpation, with State aid according to a graduated scale, by which the Government should contribute one-eighth of the cost if under £100, one-fourth if £100 or under £500, one-third if £500 or under £1,000, and one-half if £1,000 or upwards. Once an area was clean it would be obligatory on the owner to keep it so. The Government and public bodies were to have similar duties imposed on them in respect of Crown or public lands.

The committee recommended immediate legislation, but at the same time urged on the Government "the desirability of carrying out experiments with all such preparations and processes as may appear feasible, with a view to ascertaining and demonstrating the most effectual and economical means of dealing with both species of Opuntia." About fifteen years ago experiments were conducted departmentally, and, as a result, a pamphlet was issued recommending farmers to uproot the plant and stack it, pricking each layer successively and spraying it with arsenite of soda. This method was from time to time favourably reported on by farmers, and a great deal of useful work was accomplished in this way. Many farmers, however, have taken no steps to get rid of the pest, and while this attitude continues farms which are not cleared will always remain a source of danger to other properties in the neighbourhood, considering that any portion of a plant will strike root where it may be dropped.

Mr. P. J. Pienaar recently patented a preparation for destroying prickly pear. This has been reported to give satisfactory results, destruction being effected by means of injections of the chemical into sections of the growing plant. While Mr. Pienaar's preparation is sold at about double the price of arsenite of soda, the cost of uprooting and stacking, speaking generally, is saved to the farmer. Other preparations have also lately come into the market.

Legislation on the lines recommended by the Select Committee would involve large expenditure. It has been roughly estimated that the infested area is about 500,000 morgen. [A Prussian morgen is equivalent to ·631 acres; a Hamburg morgen represents 2·38 acres.—Ed. "Q.A.J."] Some farmers reckon that the cost of clearing ground of prickly pear under the method recommended in the departmental pamphlet is about 5s. per morgen. If this may be taken as a guide, the cost of clearing 500,000 morgen would be £125,000. A full report of further experiments in this direction which have been completed may be expected shortly.

In Queensland, the cost of clearing the prickly pear has ranged from £5 to £15 per acre, which would bring the cost of clearing 500,000 acres (at an average of £10 per acre) to the enormous sum of £5,000,000. If the morgen represented half an acre, or one acre, or 2·38 acres, the pear cannot be anything like so thick as it is in Queensland if it can be cleared for 5s. per morgen.

BUYING SEEDS BY MEASURE.

It is inadvisable to buy seeds by the pint, gallon, or bushel. And this stands to reason, because a low weight per bushel means that large numbers of the seeds have lost their vitality, either owing to imperfect maturity, destruction of the germ by insects, or some other cause. An experiment lately made in India with wheat showed that in some cases as much as 63 per cent. of the grain was destroyed by weevils. Seed should always be bought by weight. It frequently happens that a measured bushel of grain, and especially of grass seeds, will not turn the scale within pounds of what the true weight of a bushel should be. The result is, greater labour in sowing, large vacant spaces when the crop appears above ground, and a far higher price paid for the seed than the amount of good seed is worth.

Farmers should study the subjoined table:—

	Weight per Bushel.
Maize	56
Wheat	60
Field peas	60
Barley	50
Oats	40
Buckwheat	50
Lucerne	60
Cowpeas	60
Paspalum, per cornsack	140
Rye grass	20
Linseed or flax	56
Couch grass	40
Cocksfoot	20
Kafir corn	60
Panicum	60

WHEAT EXPERIMENTS AT ROMA.

By H. C. QUODLING, Inspector of Agriculture.

The unsatisfactory reports concerning the prospects of the wheat crops in the Southern States, and the prospective shortage in production, are likely to bring about higher values for grain, milling products, and offals in the near future.

Turning to our own State, we not only have a reflection of the disabilities under which "the man on the land" has to suffer, but, with increasing prices for the daily bread, the community begin to realise that something is amiss.

Notwithstanding pessimistic reports from time to time as to the prospects of the wheat crop in Queensland, it seems certain, should no untoward circumstance arise, from half to a three-quarter crop should be garnered.

On the Darling Downs, near the Main Range, the hygroscopic conditions have been more favourable, and crops are likely to give more satisfactory returns; but where the influence of the Western and South-western climate is felt the returns will be slightly below normal.

The experiences of individuals in combating extreme seasons, rust, and other diseases in their crops, place them in an unenviable position, inasmuch as they, as individuals, cannot afford the time and money to carry on regular experiment work, but have perforce to devote their energies to making a living by the most direct means, often involving great risks.

Science, when applied to agriculture in combination with practice, is recognised as a means whereby the many problems of the producer may be satisfactorily solved, and well-defined laws of tillage and rotation must be observed to secure the maxium of result. In Queensland, as in other States and countries, there is ample scope for research work. Competition is becoming so keen that any means of improving the position of the producer soon has its effect in the increased prosperity of the country. Taking a single instance, that of the wheatgrower, it must be borne in mind that, with depleted means as a result of reduced crops, the condition of these men calls for every support and encouragement.

Various experiment stations have been established throughout the State, and, as the most recent—at Roma—is destined to deal more particularly with wheat on account of its position, a short description of the work undertaken may prove of interest.

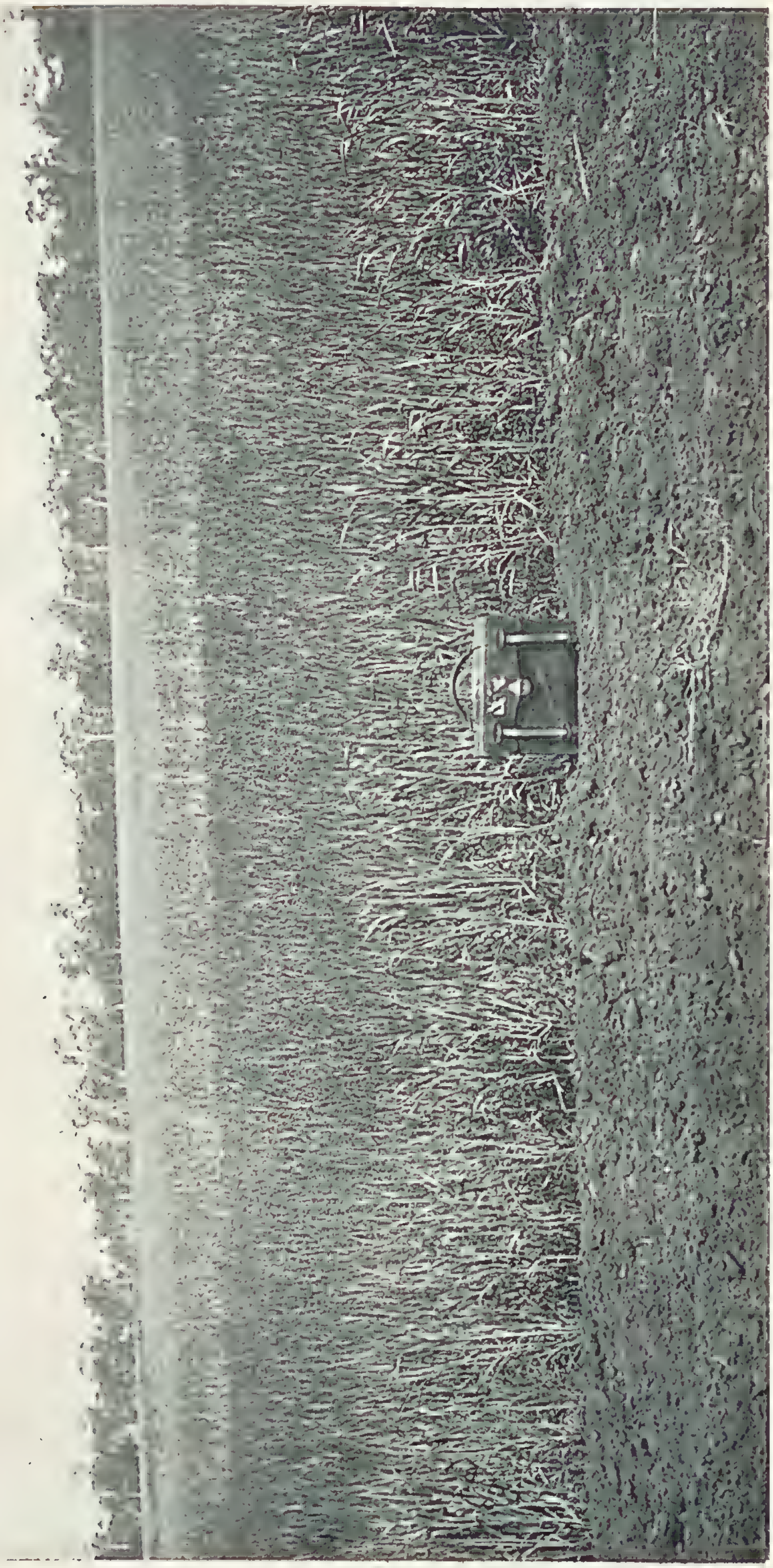
In America some prominence has been given in the Press and by advertisement to what is known as the "Campbell Dry Soil System of Culture," and claims have been made that its adoption will be the means of pushing the wheat belt out into arid regions hitherto regarded as outside the pale of cultivation.

At Roma, two areas of 20 acres each have been set apart for duplicate experiment work with this system, to embrace two classes, characteristic of soils on which wheat is grown—viz., the red sandy loam overlying a clay subsoil, and the chocolate-coloured loamy soil of the box flat country. Briefly, the object of the system is to conserve two years' rainfall for the use of a single crop by continuous bare fallowing. To accomplish this, well-defined rules of tillage must be followed in order to save and store up the rainfall. An implement differing from those in general use for wheat cultivation, and on which some reliance is placed by the promoter of the system, is the "Campbell sub-surface packer," and illustration appearing on the accompanying page.

By the use of the packer and harrows to follow up each day's ploughing, the lower portion of the furrow is pulverised and compressed, and a mulch formed on the surface, preventing excessive evaporation.

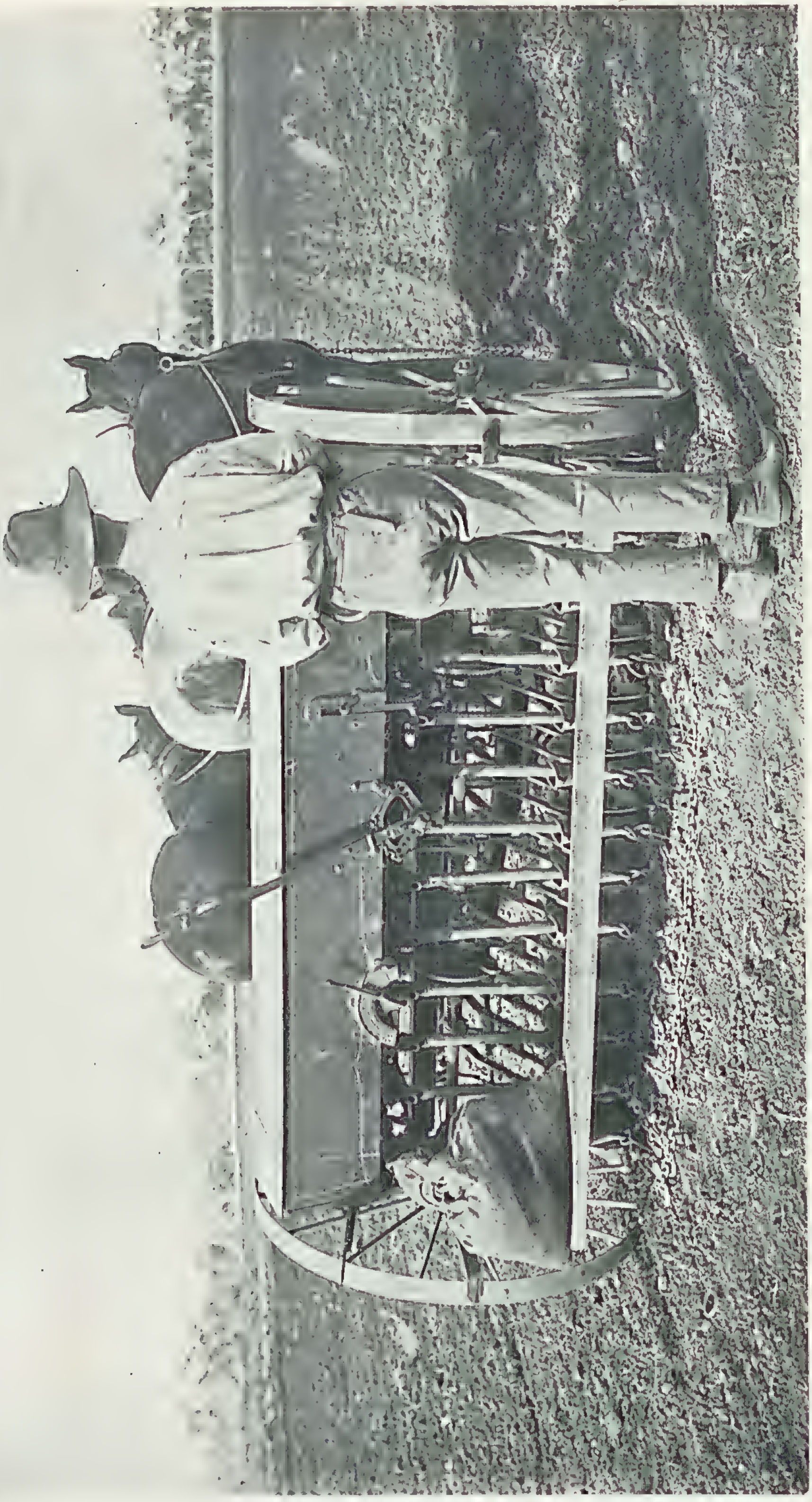
Due regard is taken of the best means of keeping the surface of the land well worked by double disc harrowing and by the use of ordinary harrows, the former immediately after removal of the crop, and the latter kept in constant use and more particularly after each rain.

Plate XXIV.



1. Experimental Wheat Plots at Roma State Farm previous to Coming into Ear, 1907.
2. Macaroni Wheats in the Foreground.

Plate XXVI.



Seed Drill at Work on Experimental Plots at the Roma State Farm.

Plate XXV.

CAMPBELL'S SUB-SURFACE PACKER AND HARROW AT WORK AT THE ROMA STATE FARM.

The difference in the climate of Queensland, with its high temperatures, short winter, and the tendency to rapid evaporation of rainfall, when compared with that of such portions of North America looked upon as suitable to the adoption of the Campbell system, where long winters and short Indian summers prevail, coupled with the percolation of moisture into the subsoil by means of melting snows and ice, may bring about contradictory results.

It is generally conceded that America is a land where individuals don't hide their light under a bushel, and where old systems are often rejuvenated under other names. In this instance, it must be admitted that the Campbell system is merely an adaptation of old and well-known tillage methods which have been successfully practised by leading agriculturists for years; but it is hoped that, by the adoption of a regular and defined system of cultivation over a series of years, it may serve as an incentive to better methods of cultivation, which are often neglected. Apart from the Campbell system, some 40 acres at the State farm have been set apart and are under crop for the purpose of carrying out experiments over a series of years in tillage and rotation of crops calculated to be of vital concern to the agriculturists in the district.

All tillage operations are carried on with the object of conserving moisture and the keeping of the surface of land in a condition to receive it; here experiments are devoted to testing various regular depths for the ploughing of land from 4 up to 12 inches, having due regard to the gradual increase in the depth of tillage to maintain sweetness and fertility.

Another set of experiments is devoted to testing the value of the after cultivation of crops.

Other series embrace the use of different quantities of seed per acre and different depths of drilling in seed.

In rotation of crops the various series are devoted to systems to maintain fertility and to test the differences resulting from bare and covering fallows.

This State, like most wheat-growing countries, suffers from periodical attacks of rust, particularly during periods of humidity, and great losses have been experienced, due to the use of unsuitable varieties.

It is patent that, before desirable types are secured and the wheatgrowers are able to proceed with some degree of confidence, there is a field for careful investigation to evolve a variety possessing desirable field and milling characteristics. This branch of work is being attended to thoroughly at Roma—first, by building up the constitution of plants by cross fertilisation, and the selection of types possessing other essential features. Numbers of wheats have been imported for observation purposes from arid regions, as well as well-known milling wheats. Macaroni wheats, too, are being experimented with, and no stone will be left unturned in the attempt to improve the status of wheat-growing.

WHAT IT COSTS TO GROW WHEAT IN SOUTH AUSTRALIA.

A very interesting discussion was held at the Reeves Plains Branch meeting on 26th July, on papers read by two or three farmers, giving an account of the profits of small farming. One farmer, Mr. Alexander, read his paper on the subject at the June meeting. He showed a total income from a farm of 172 acres (wheat and hay) to be £518 8s., and the cost of production £182 1s. 4d., leaving a credit balance of £336 6s. 8d. Singularly enough, he allowed nothing for labour or interest on capital. Mr. R. H. Oliver, another farmer, gave a very different estimate, in which he showed the expenses to amount to £265 6s. 6d., to which was to be added £61 5s. for rent or interest, leaving the farmer a credit balance of £48 10s. 6d., on which to keep himself and family, replace lost stock, &c. The members of the branch considered that Mr. Oliver's figures were very near the profits in that part of the district.

Wheat-growing alone seems to be a very uncertain business, and at best there are other crops which pay far better, whilst dairying, pig-breeding, and lamb-raising would stand to the farmer better than the single crop of wheat.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 30TH SEPTEMBER, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Honeycomb	Shorthorn ...	23 Aug., 1907	614	4·2	28·88	
No. 112 ...	Grade-Jersey ...	23 Aug. ,,	664	3·8	28·26	
Dot ...	Shorthorn ...	8 Aug. ,,	581	4·2	27·33	
Restive ...	,, ...	21 Aug. ,,	589	3·8	25·06	
Rosalie ...	Ayrshire ...	17 Aug. ,,	586	3·8	24·94	
Night ...	Holstein-Devon	28 May ,,	564	3·8	24·00	
Chocolate ...	Shorthorn ...	5 Mar. ,,	528	4·0	23·65	
Sue ...	Grade-Shorthorn	22 April ,,	517	4·0	23·16	
Laura ...	Ayrshire ...	20 May ,,	572	3·6	23·06	
Gem ...	Shorthorn ...	29 Aug. ,,	601	3·4	22·88	
Clare ...	Jersey	21 Aug. ,,	473	4·2	22·25	
Butter ...	Shorthorn ...	22 Aug. ,,	550	3·6	22·17	
Pee-wee ...	Holstein-Sh'rth'rn	6 April ,,	546	3·6	22·01	
Daisy ...	Holstein	30 Aug. ,,	650	3·0	21·84	
Hettie ...	Ayrshire-Sh'th'rn	27 April ,,	475	4·0	21·28	
Eve ...	Jersey	27 Aug. ,,	498	3·8	21·19	First calf
Dripping ...	Holstein-Sh'rth'rn	28 Nov., 1906	472	4·0	21·14	
Princess ...	Shorthorn ...	13 Aug., 1907	486	3·8	20·68	
Blank ...	Jersey-Ayrshire	4 Feb. ,,	415	4·4	20·45	
Lass ...	Ayrshire ...	19 April ,,	469	3·8	19·96	
Nettle ...	Shorthorn ...	17 May ,,	494	3·6	19·92	
Ethel ...	Grade-Holstein...	22 Aug. ,,	494	3·6	19·92	First calf
Rhoda ...	,, Shorthorn	12 Mar. ,,	492	3·6	19·83	
Donah ...	Holstein	30 May ,,	497	3·5	19·48	
Poppie ...	Guernsey-Jersey	24 Feb. ,,	427	4·0	19·13	

NOTE.—Cows fed with a daily ration of ensilage and wheaten chaff moistened with molasses. They also had an occasional grazing on lucerne.

DRY BIBLE.

At a meeting of the Hartley Branch of the South Australian Bureau of Agriculture, on 17th August, the chairman, Mr. Wundersitz read a short paper on this subject, in which he stated it seemed almost incredible that so much loss was still caused by this complaint, which he maintained could easily be prevented by the simple treatment he recommended several years ago—*i.e.*, bone-meal, sulphate of iron, and salt, given in a box or small trough, so that the cattle could take it whenever inclined. Since commencing to use this preventive, eight or nine years ago, he had not lost a single beast from "dry bible." He advised members to provide this lick for their cattle, especially when they were observed standing about chewing a bone, old boot, or piece of rag, as this clearly showed they needed something that they could not obtain in the ordinary food.

MILK TESTS AT THE SHOW OF THE EASTERN DOWNS HORTICULTURAL AND AGRICULTURAL ASSOCIATION, WARWICK.

Captain Webb, who is dairy farming near Warwick, has sent us the following report on the milk tests at the last show of the Eastern Downs Association, taken from the "Warwick Argus." It will be noted that the cheapest cow is not always the worst dairy cow, the winner being a sort of a cull, for which the owner gave only £4 10s:—

A feature—amongst dairymen undoubtedly the feature—of the show was the milk test inaugurated by the society, and carried through successfully with the assistance of the inspectors of the Agricultural Department under the Dairy Act—Messrs. Jost and Cross—who supervised the milking of the cows and the forwarding of samples to the Analytical Chemist of the Agricultural Department (Mr. J. C. Brünnich). The conditions of the test were that the cows entered were to be the *bonâ fide* property of dairymen within the district of Clifton to Killarney, to Thane's Creek, and the New South Wales border, and the award was to be made to the cow yielding the largest amount of commercial butter in two milkings. The importance of this forward step of the society was recognised, and with the assistance of the butter factories doing business in the district the prize money totalled £17 17s.—1st, £10 10s.; 2nd, £5 5s.; and 3rd, £2 2s.—presented by the Warwick Butter and Dairying Company, Silverwood Dairying Company, E.D.H. and A. Association (each £5 5s.), and the Lowood Creamery Company (£2 2s.) The conditions of the contest were that entries should close at 4 p.m. on 5th January, the exhibitor to state breed, age, description, brand, and the feed the cow had been on for one month previously. The cows were milked on the respective farms of owners under the supervision of an officer of the Department, and were to be made available for milking between 7th January and 9th February. The officer saw each cow milked dry at one milking, and supervised two milkings within twenty-four hours following, which were weighed, and from which samples for testing were taken. Another condition of the contest was that all cows were to be exhibited on the opening day of the show, but, owing to the impossibility of the Department having the figures available in time to carry out the intention of the society, which was to have full particulars attached to each cow stall. It was hardly to be expected that a contest embracing such comprehensive work would be carried through its initiation without a hitch, and in future years (for it is to be hoped the society will perpetuate such contests) more time must be allowed previous to the show in order to allow the preliminaries to be completed well before opening day. The results of the competition were computed on O'Callaghan's chart, and all cows yielding 2 lb. or more of commercial butter in the two milkings were awarded certificates of merit by the society. As evidence of the popularity of the contest among dairymen, no less than 25 entries were catalogued from Clifton, Sandy Creek, Warwick, and all centres along the Killarney line, and from Talgai West. The names of the three winners in the competition were wired to the secretary on the 13th February, and the order ran:—E. F. Morey's Model, 1; S.A.I. Company's Golden Spray, 2; and F. H. Kates's Edna May, 3. The necessarily incomplete information served only to excite keener interest in the competition, and the mailed results that arrived on the 14th were awaited with great interest. The success of Mr. Morey's cow over some of the more fashionably-bred animals of the competition was a matter for particular remark. This cow was hopelessly outclassed on looks, and was bought by her owner from a mob at a cost of £4 10s. From the gentleman who brought the mob from the Clarence River district of New South Wales we learn that her breeding embraced an original Hereford crossed with Ayrshire and Jersey. The splendid results achieved by this cow cannot be over-estimated, and her undoubted value as a breeder for dairy purposes is apparent, particularly when a comparative survey of the subjoined table is undertaken. The success of Mr. Morey should inspire other dairy farmers to enter in future competitions of this

class, for Mr. Morey's win clearly demonstrates that not amongst the aristocratic herds alone are to be found the cows that milk the sovereigns. In concluding these remarks, it should be noticed that the moving spirit in bringing about this contest was Mr. T. H. Affleck, and at the time of his advocacy many members doubted the success of the venture. The altogether excellent results that have followed are a matter for congratulation to that gentleman as well as to the society; for not in Warwick and district alone has the competition excited interest, but from kindred societies as far north as Bundaberg inquiries concerning its working have come to hand, and individual inquiries concerning its working have been more or less general over a great area of Southern Queensland. We publish the following table of the result of the contest, feeling sure it cannot fail to interest all dairymen:—

Name and Address of Owner.	Name of Cow.	Test.	Milk.	Commercial Butter.	Test.	Milk.	Commercial Butter.	Total Commercial Butter.	Date.
		%	Lb.		%	Lb.			
W. H. Farrington, Clifton ...	Kit	3·95	22	·96	4·40	19½	·96	1·92	1-2-07
M. J. Brosnan, Clifton	Aileen ...	3·65	23½	·94	3·7	21½	·87	1·81	9-2-07
J. Free, Clifton	Primrose ...	3·80	23¼	·98	4·3	18½	·88	1·86	29-1-07
F. H. Kates, Hendon	Edna May ...	3·5	28	1·07	3·85	22½	·96	2·03	9-2-07
F. H. Kates, Hendon	Beauty ...	3·2	17	·59	4·0	19½	·64	1·23	9-2-07
S.A.I. Co., Talgai	Golden Spray	4·80	23	1·23	4·5	20	1 00	2·23	5-2-07
S.A.I. Co., Talgai	Beauty ...	3·85	19	·81	4·65	18	·91	1·72	5-2-07
G. and A. Gillespie, Glengallan ...	Nora ...	5·65	19½	1·23	3·20	19	·65	1·88	7-2-07
Margetts and Son, Henley ...	Cherry ...	4·0	16	·71	5·8	14	·91	1·62	29-1-07
Margetts and Son, Henley ...	Primrose ...	3·40	20	·74	4·1	15	·68	1·42	29-1-07
G. and A. Gillespie, Glengallan ...	Goaty ...	4·60	15	·77	4·70	15	·78	1·55	7-2-07
E. F. Morey, Warwick	Model ...	6·25	19½	1·38	5·95	14	·94	2·32	20-1-07
J. W. Bradford, Tannymorel ...	Kitty ...	3·95	23	1·00	4·30	18	·70	1·70	24-1-07
J. Brosnan, Wiyarra	Ginger ...	4·20	19	·88	3·70	19	·77	1·65	22-1-07
A. S. Boyce, Warwick	Daisy Bell ...	4·20	19¾	·93	4·2	17	·84	1·77	13-1-07
Miller and Cornish, Warwick ...	Model ...	3·80	15½	·65	4·9	15½	·85	1·50	3-2-07
G. P. Barnes, Warwick	Buttercup ...	2·15	21	·46	5·0	24½	1·37	1·83	28-1-07
G. P. Barnes, Warwick	Firefly ...	3·6	21½	·85	4·6	20½	1·04	1·89	28-1-07
R. Rankin, Derreen	Berry ...	3·2	19	·85	4·3	17	·81	1·46	26-1-07
P. J. Peterson, Rosenthal ...	Buttercup ...	5·05	13½	·77	6·10	10	·69	1·46	17-1-07
J. McLean, Sandy Creek ...	Buttercup ...	2·50	16½	·63	3·75	14	·57	1·20	5-2-07
Jas. Seymour, Chiverton ...	Snowdrop ...	3·7	18½	·75	4·20	17	·80	1·55	1-2-07
Jas. Seymour, Chiverton ...	Hilda ...	3·6	20½	·81	3·85	18	·66	1·57	1-2-07

RAMIE.

Mr. J. Medley Wood, A.L.S., in the "Witness," sounds a note of warning to those who may be inclined to plunge with over-zeal into a ramie-growing business. In the journal, from the very first, while republishing unstintedly the glowing panegyrics periodically being given to the public on this undeniably splendid fibre, we have also from time to time pointed out some of the more obvious inconsistencies as regards the alleged profits to the growers. Mr. Medley Wood says that, if the machine referred to by Mr. W. J. Bell in his article on ramie in the last issue of the journal will do what is claimed for it, the future of ramie is assured. As will be seen, all hangs on the word "if." The description of what this machine can do is taken by Mr. Bell from the "South American Journal." What that publication says the machine can perform sounds marvellous. In one day it will produce a ton of what is selling in London from £30 to £40 per ton, and of better quality, from a material that one of the chief apostles of the industry (Mr. Radcliffe) asserts can be grown with Asiatic labour for £7 or £8 per ton. All, we repeat, depends on the word "if." The Indian Government have offered on more than one occasion prizes of £5,000 for the invention of such a machine. It is said that inventors—British, French, German, and American—have expended hundreds of thousands in money for the production of such a machine. If the qualities are as stated, confirmation from India, China, Egypt, &c., may soon be expected. In the meantime, the hope may be expressed that writers on ramie will be more specific in their terminology; reference to ribbons, filasse, fibre, China grass, &c., as one and the same, also decortication and degumming, accounts for infinite confusion when considering the question of profits.—"Natal Agricultural Journal."

The Horse.

A TRUE WILD HORSE.

In the September issue of the Journal we published a paragraph from the "Peebleshire Advertiser" on "Prjevalsky's Horse," sent to us by Mr. James Moffat. Mr. Moffat nows adds further interesting suggestions on this animal, culled from "The Scotsman." That journal says:—

A hybrid between Prjevalsky's horse and a Highland pony is on exhibition this week at the Highland Show at Edinburgh, and Professor J. Crossar Ewart read an interesting paper on the subject to the Royal Society lately. All, he said, seemed agreed that in the horse of Prjevalsky, discovered in Central Asia in 1881, was a true wild horse, and many seemed inclined to look upon the wild horse still surviving in the Great Gobi desert as closely related to a large-headed species hunted by Paleolithic man some 30,000 years ago in the Rhone Valley. Now, had the horse now living under domestication descended from an ancestor of the Prjevalsky type domesticated during the Stone Age? It might, at least, have played an important part in the making of some of the domestic breeds. The sire of the hybrid now on show was a Prjevalsky horse imported from Mongolia in 1901, and the dam a bay 12 hands Highland pony. The resemblance between the Prjevalsky hybrid and a cross-bred pony supported the view that a species like the wild horse of Mongolia had taken part in forming domestic breeds.

THE HORSE WHISPERER.

A member of one of the Queensland contingents which went to South Africa during the Boer war told us a remarkable story of a wild horse on board the transport ship, which was absolutely untameable until one of the men undertook to make it tractable. He went to the stall where this wild animal was, and said a few words, which had the effect of instantaneously bringing the animal into docile subjection. This story, told at a club, was disbelieved. We now find corroboration of it in an article on "The Horse Whisperer" in the "Live Stock Journal," and, as it is most interesting, we give our readers the benefit of it:—

The horse whisperer might be an unknown quantity in England and Ireland to-day, but there are not a few men who exercise a wonderful control with their voices over horses which, when the dominating influence is absent, are apt to, literally, kick over the traces. In the thoroughbred stables of England and Ireland to-day there are not a few stablemen and jockeys who succeed in holding in check the vice in horses which in demonstrative manner show that they cannot tolerate the presence of other grooms or attendants. "Nimrod" claimed for Count Duval a power and influence of the human voice over the brute creation, but that power was backed up by a lecture to the horse with "his clenched fist in his face." But the horse whisperer of to-day avoids all gesticulation, and trusts entirely to a combination of sounds or words. There is no bullying done, and the whisperer can face a mad horse with his hands behind his back, and apparently at the mercy of the beast that has to come under the charm. One means of keeping remount horses quiet in stations during the South African war was that employed by the Yeomen, who sat in a ring of head-to-head horses singing as loudly as possible, and riveting the ears and attention of the otherwise sprawling and hungry animals. One of the first whisperers to acquire was Con Sullivan, who migrated in his youth from Killmallock, where he could trace his genealogy through a long line of snafflers, and became almost exclusively employed by Lord Doneraile.

So unaccountable and so magical was the power Sullivan instantly acquired over the most savage brute that his parish priest, who had excellent grounds for not believing him a saint, denounced him as a sorcerer. The whisper of this man made an indelible impression upon any horse, bringing the pupil to a degree of docility unattainable in the ordinary course of discipline.

The racehorse King Pepin, a famous racer, vicious, and reputed to have killed two grooms at the Curragh, once came under his charge. He was wanted to win a race at Mallow, but when saddling time came it found him in one of his unmanageable moods. He reared, plunged, and flung out fore and aft, until he completely cowed groom and jockey. It was at this crisis that someone recommended that he should be "whispered." As it was the only chance left of taming him in time for the start, his owner gladly availed himself of it, though warned that horses were sometimes thrown into a state of stupor by the process.

Sullivan was soon found, and he was delighted at the opportunity of "fwhuishperin' before so much 'quolity' from all parts." "Show us the wild baste," said he, "and we'll soon tache him manners." When he got within the circle, and a wide one it was, in which King Pepin was playing his antics, he walked up to him, approaching the horse from behind. He mumbled some words as he walked, which, though not quite inaudible, were as unintelligible as a sermon in the unknown tongue, but they had a most magical effect on the horse, for he stood stock still. Sullivan then patted him on the neck, while he whispered a word or two in his ear, whereupon King Pepin went on his knees, and incontinently lay down. The whisperer then stretched himself on him at full length, took out a pouch containing pipe and tobacco, flint and steel, struck a light, and blew a cloud, as he lounged on the stomach of this high-mettled colt, with as much composure as if he were seated on a bench in his favourite taproom. After two or three puffs, he got up, beckoned the nag to his legs, saddled him, and walked off to the starting-post, the horse following and fawning upon him like a dog. He won the race in a canter.

Sullivan's introduction to Lord Doneraile should be told in story, as it once was by Con's son, a whipper-in of some repute. His lordship was driving his coach and four from Ballygiblin, when Wildfire, the off-side wheeler, lost a fore shoe and went lame. The horse was "a born divil in regard of shoeing him," and usually had to be slung before the operation was performed. His lordship was for throwing the horse down, and the blacksmith, Shawn Gow, was against it. They were debating the point when Sullivan came upon the scene.

"'God bless the work,' siz he, 'an' thim that's at it, not overlookin' your honour an' the cattle,' takin' off his hat to the lord; 'and may a poor boy make bould for to ax what hoult you're in?' 'A hard case enough,' siz the lord himself, tellin' him all about it, jest as I'm afther tellin' your honour. 'Shure then,' siz Soolivan, ''tis myself is the boy can relase you, if that's all that's throublin' you.' ''Tis asier said than done,' siz the lord. 'The divil a taste!—not conthradictin' your honour,' siz my father; 'jest lave the boys be afther untacklin' him out, and let myself an' himself have as much as one minit's discoorse all alone to ourselves inside in the forge there, an' I'll give you my head in my hand if I don't make him stand as quiet as e'er a baste your honour ever spread your fork upon.' 'Any port in a storm,' is a good maxim, thought Lord D., so he ordered Wildfire to be unharnessed. 'Goosh a chopuleen!' siz Soolivan, an' into the forge he walked, the horse follyin' him as tame as a spannil would a dog tacher. 'My eye, if that 'ere chap ain't a rum un!' said coachee. But little time my father gave 'em for talkin', when he bid 'em walk in. 'What's that I sees?' cried the lord, openin' his two eyes like a body would be afther seein' a ghost. 'Wisha, nothin' at all, your honour,' siz the Fwhuishperer, 'only a little adwice I'm afther givin' this poor baste, in regard of the foolishness of sayin' agin them that wor for his good, and he's no way fractious now, for siz he to me, afore I spoke three words to him, siz he, "What's your will is my pleasure, and I'll never no more do nothing out of the way"; and' I'll be bound he'll have Shawn Gow lift his leg as paceable as if he was but skin and bone.' When the

sarvants, and the smith, and the rest of 'em seen him houldin' up Wildfire's leg, it bein' the first time he done anything of the likes in Dulhallow, faix, they had a mind to be in his wool, thinkin' him no betther nor the ould boy himself."

Even when the hot shoe was clapped on to his hoof the horse failed to stir, and Sullivan had to be requisitioned again to make Wildfire straighten his leg.

Another performance of Con's was on an artillery horse, pronounced unmanageable and unserviceable by men and officers. He was put in single and double harness, as leader, and to the wheel, alternately coaxed, beaten, or dragged along, but all to no purpose; not an ounce would he draw, and he was fit for nothing else. At last he was sold by auction for a few shillings, the Whisperer being the purchaser. No sooner was the precious lot knocked down to him than he asked a carman who was passing by to lend him cart and harness. He put him to at once, then led and drove him up and down the steep hill, near the old market gate, to the utter amazement of the artillerymen, who were not long enough quartered there to have heard of him. He did not strike him, and no one heard him say a word, but of course he gave him the whisper. He sold the horse in five minutes after for as many pounds as he gave shillings.

Horse whispering has been utilised for other purposes. In "Romany Rye," George Borrow asks a jockey how he would whisper a horse out of a field if he were down on his luck. Replies the jockey:—

"I whispers a horse out of a field in this way; I have a mare in my stable; well, in the early season of the year I goes into my stable. . . . Well, I puts a sponge into a small bottle which I keeps corked. I takes my bottle in my hand and goes into a field where there is a very fine stag horse. I manage with great difficulty to get within ten yards of the horse, who stands staring at me just ready to run away. I then uncorks my bottle, presses my forefinger to the sponge and holds it out to the horse; the horse gives a sniff, then a start, and comes nearer. I corks my bottle, and puts it into my pocket. My business is done; for the next two hours the horse would follow me anywhere—the difficulty, indeed, would be to get rid of him."

Borrow knew a cob in Ireland which could be driven to a sense of kicking madness by a particular word used by a particular person in a particular tone. The same cob could be smoothed in a moment by another word used by the same individual in a very different kind of tone. The word was "deaghblasda."

Many notable thoroughbreds have had to be "whispered." Tristan, the winner of twenty-three races, including the Ascot Gold Cup, the Champion Stakes, and the Hardwicke Stakes, could not tolerate a grey horse or pony. Once nobody could be found to put his head collar on. Several stable lads failed, and in one instance Tristan fancied the pattern of one lad's trouser cloth. "Ginger," who usually looked after him, was found, and asked to go to the horse. He did—with a broom. He "whispered" something—to the effect, "Do you see this?"—and the savage did, for he simply lay down to be "done" for the night.

CASSAVA FLOUR.

In reference to the production of cassava flour for use by textile manufacturers in Lancashire and elsewhere, the following information has been received by the Imperial Commissioner of Agriculture from the Hon. H. H. Cousins, M.A., Government Chemist, as to the value of the cassava starch exported from the island of Jamaica:—

"With reference to the 'cassava flour' matter referred to in your letter J. 1,953, I can state that the latest sales of cassava starch made in Jamaica have been at £14 per ton, c.i.f. Liverpool. I also know of a contract made last year for a regular supply, at £16 per ton, for a well-made starch. Our Jamaica starch has been proved greatly superior to the East Indian cassava starch."

Poultry.

POULTRY-FARMING.

A writer in the "Farmer and Stockbreeder" makes what are now very trite, but very true, remarks on poultry-farming as a separate business, apart from ordinary farming. He says:—

There is an impression, generally confined to town people, that poultry-keeping is a sure road to fortune. Many a townsman has gone out into the country and invested all his savings in a poultry farm, with the result that he has become a poor man, and has had to return to the city whence he came, in order to make his fortune over again. The reason is that many people get a peculiar complaint which has been described as "hen fever." People begin by keeping a few fowls in a pen in their garden or their yard, and these birds do very well, lay regularly, and so on. Their owner, finding that a few fowls pay to keep like this, jumps to the conclusion that he has only to multiply his poultry establishment and keep thousands instead of tens to make a proportionately large profit at comparatively little trouble. Now, this method of reckoning is fatal to success, and the reason is this: Poultry only pay when they receive individual attention. The country cottager who has a dozen fowls running out in the lane gets a bigger average return per head than the farmer who has several hundreds running together on the farm, because each of the dozen cottage fowls running in the lane gets well fed with scraps from the cottage, and is looked after by the cottager's wife, whereas the individual fowl on the farm has to get its own living largely, and is not receiving the individual attention which the other gets. The question of employing a large amount of capital, therefore, in poultry-farming investments is really one upon which at the outset one ought to warn the intending beginner to proceed most cautiously. Poultry pay as a farming extra. They do not pay as the sole object of farming. To rent house and land and employ labour with an idea of making a profit will end, as it always has ended, in failure, so that the capital employed should be as small as possible. Any expenditure in purchasing poultry beyond that necessary to provide a few pens of good breeding stock would be very unwise. It is far better to employ the first year's work in raising your own poultry. A hundred pounds expended in suitable buildings, wire-netting, and sundry appliances is quite as much as a beginner in poultry-farming ought to expend. High-priced ornamental houses and all extravagances of that kind are money thrown away. The plainest of houses, so long as they are built of strong sound wood, and the simpler the contrivances throughout, the better. No man is fit to undertake poultry-farming unless he is what can be termed a "handy man," capable of doing carpentry and work of that kind.

A hundred pounds expended in the manner described will furnish the beginnings of what may be quite a considerable poultry farm, and if this sum be adhered to there is far more likelihood of success being achieved and disappointment avoided than if ten times the amount were spent.

The Foundations of Success in Poultry-raising.

The same writer dilates upon poultry-raising generally and on egg-farming as follows:—

There is probably no pursuit into which people enter with more of enthusiasm and less of method than poultry-keeping. Yet it is above all things

necessary to success that this pursuit should be entered upon with coolness and calculation, with firm resolve to meet trouble and disappointment with equanimity, and with still firmer resolution to follow out patiently and consistently a "plan of campaign," based upon careful consideration of available facilities and of the precise object in view. For, be it understood, there are several departments of poultry-keeping—in fact, there are three branches. First, there is poultry "fancying"; then there is egg-farming; and there is also chicken-raising. Each is a pursuit in itself—needing quite different technique and management. Take the poultrv fancier. His idea is to keep a limited number of birds of high quality—a few specimens as near perfection as careful selection and strict study of the laws of breeding can enable him to produce. He wants birds that will earn distinction and bring him cups and other trophies for the decoration of his house. The fancier proper must learn to regard himself as the patron of some particular breed, and he must be prepared to take his part in promoting the interests of that breed. No so the man who intends to interest himself in

Egg-farming.

He will probably have profit in view rather than pleasure. If he be a landed proprietor or a country gentleman with an interest in the people around him, he will want to establish a model poultry farm, laid out in such a way that the best results in egg-production can be obtained at the smallest cost, and he will want to show by his own example and by his own balance-sheet that there is profit in egg-farming—as undoubtedly there is. Lastly, there is the third branch of the pursuit—the production of table poultry. Here will come in the question of hatching artificially a large number of chickens, which will have to be reared with as much expedition as possible, and fattened off and sent to market on the most approved modern principles, and in the best possible style. This branch of poultry-keeping, it may be said, requires a good area of available land, and cannot be attempted satisfactorily except upon a large scale, whereas egg-production can be attempted on a small scale or a large scale, just according to the taste and fancy of the experimenter.

These are the several different branches of the pursuit of poultry-keeping for pleasure and profit, and, in order that a new beginner may be successful, he must make up his mind to have a definite object in view, and to pursue that object persistently. It is quite useless to attempt too much. True it is that many people who have time and room and capital all combined can often take up poultry-fancying as well as poultry-farming. Indeed, the thing is done, and that frequently; but the ordinary individual, and especially the inexperienced beginner, will find it better to select one or other of these distinct branches and follow it out as his chief object. Experience is the first essential to success in poultry-keeping. Every man who undertakes it will have to go through an apprenticeship of woe, which will be greater or less, according as he proceeds on unwise or on reasonable lines. So that the first thing to do is to choose the object towards which to work. In doing this is will be necessary to have regard to the accommodation available; and then the second matter to decide upon is the choice of a breed or breeds. In this, soil and situation will have to be considered. Some breeds thrive very well on low-lying land, whilst others would do well in the most exposed situations. This is an example of the way in which all matters need to be gone into when the choice of breeds is being made. It is not of any use attempting to raise market poultry if the situation available is one where the breeds which are best for table do not thrive well. A warm and sheltered situation in a valley, say between two rows of hills, is a good place in which to rear Indian Game and Dorkings, which, as probably most of the readers of this journal are aware, is the premier variety, or rather the premier first-cross for producing table birds. Situation needs particularly to be considered when egg-production is intended to be the object in view. Egg-production, if it is to pay well, must be fairly uniform throughout the year.

BREEDS FOR LAYING.

Any breed of poultry will lay pretty well anywhere during the summer; but for eggs to be produced in winter, when the market is not well supplied and prices accordingly rule high, it is necessary that special provision should be made, and the first thing to consider in making this provision is what breed will be suitable. It is quite useless, for instance, to expect birds of the long-combed varieties to lay during the winter in an exposed situation. These breeds are renowned for summer laying, but they invariably suffer from the effects of the winter, and the more exposed the situation is in which they are kept the less likelihood there is that they will lay at all when the cold weather comes on. On the other hand, there are certain breeds which have the reputation of beginning to lay in the autumn and of laying better in the winter than in the summer. Such breeds are what is known as the Asiatics. The Langshan and the Brahma are typical examples, and to these may be added the Orpington, which is a modern breed founded largely upon the Buff Cochin (another breed introduced from Asia), and the Wyandotte, which last-named, although not Asiatic in its origin, still has been produced in America largely with a view to meeting the demand for a good winter layer. Now, any one of these four breeds which I have mentioned will thrive well in cold, exposed situations, and they are all birds with small combs, so that they cannot suffer from frostbite in the same way as the more delicate Mediterranean breeds will suffer. But it is not only with regard to general situation that care needs to be taken. A particular district may be sheltered or exposed—that is to say, the country may be flat, open, wind-swept country all round, or it may be a district surrounded by hills and with numerous valleys. Each poultry-keeper must consider not only the situation in which the land is placed, but also he must reflect upon the different aspects of his land. He wants to consider which part of his property is most suited for poultry-raising. If he can find a sunny slope facing the south, there it will be wise to locate his poultry. If he cannot find a favourable aspect like that he must do the best he can, and must not forget that a great deal of success may be decided by the discretion he exercises in locating his poultry pens.

A bulletin on poultry issued lately by the Department of Agriculture in the Canadian province of Alberta contains, in almost the same words as we have quoted above, a warning against establishing a large poultry farm because a man has been successful with a few. This belief, the writer says, has caused fortunes to be lost.

CASTRATING OSTRICHES.

A correspondent, writing to the "Agricultural Journal of the Cape of Good Hope," asks:—Is castration of ostriches on a large scale to be recommended for ostrich farmers? Has the operation a calming effect on the male bird, and does it, in consequence, improve its general condition and feathers? Can the operation be performed without any great risk to the bird?

The journal, in reply, publishes an extract from the "Oudtshoorn Courant," which we print, as it may, by and by, prove useful to breeders in this State, when ostrich-breeding (already commenced near Jericho) becomes an established industry. It is as follows:—It is just about a year ago that Mr. S. Elley, the resident Government Veterinary Surgeon, began demonstrating and experimenting with his theory of the castration of ostriches in this district. It is time, therefore, that we looked for some results, and what do we find? At the outset of Mr. Elley's experiments, before he came to this district, he operated upon half a dozen cock birds belonging to Mr. Probart,

of Glen Harry, in the Graaff-Reinet district, the owner at the time telling the operator that he did not consider the birds worth £1 apiece. Now he tells Mr. Elley that he has had heavy and very much improved pluckings from these birds, and that their value has increased 1,000 per cent. Mr. Walter Rubidge, M.L.A., of Graaff-Reinet, has had 250 cocks operated upon, besides having a number of hens speyed, and he is little short of enthusiastic over the results, saying that the system will cause a small revolution where ostrich farming is carried on in big veld camps, as there will be no more unmanageable birds to deal with, and broken and spoiled feathers will be reduced to a minimum. Mr. C. G. Lee, of Klipplaat, is also a complete convert to the system, and Mr. Elley is going to operate upon a large number of birds for him. The names we have mentioned are a sufficient guarantee that ostrich farmers of the highest standing in the Midland districts are pinning their faith to a new article of creed, and that our veterinary surgeon has really "struck oil," as the Americans would say. In this district the system has not yet "caught on," which may be accounted for by the fact that most of the experiments have been conducted with birds belonging to owners of quiet camp-bred stock, and that the real value of Mr. Elley's new departure has not yet been sufficiently demonstrated in regard to birds running half wild in big veld camps.

OSTRICH-FARMING.

Some months ago (says the Rockhampton "Bulletin" of 1st October) reference was made in these columns to the enterprise of Mr. T. Behan, of Garfield, in the Jericho district, in introducing ostrich-farming into the Central division, and our readers will be glad to learn that Mr. Behan is quite satisfied with the results that, so far, have attended his venture. Writing from Garfield on the 27th of September, he says: "I thought it might be of interest to you to know that since the arrival of the ostriches here in May I have succeeded in getting from them a plucking of feathers, which, according to London market quotations, are worth from £20 to £44 per lb. I have about 1¾ lb. from my two birds, and this was by no means a full plucking. I was obliged to sacrifice a great number of the feathers, owing to their having been damaged through the long journey of the birds in crates. This week I have been successful in getting a fine flock of young ostriches—thirteen in all—and they are both strong and active. So far everything, under the most trying circumstances—a big drought—has turned out well. Therefore, I feel sanguine of success, and am more than ever convinced that the Jericho desert is the home of the bird."

OSTRICH FEATHERS, BARRING.

Ostrich-farming is an important feature in the agricultural life of South Africa, and the ostrich feathers exported have an annual value of £1,500,000. The occurrence of "barring," or faults of colouring in the feathers, which not infrequently happens, reduces their market value, and, therefore, the introduction (by Dr. J. E. Durden, Professor of Zoology at the Rhodes University College) of a system of treatment for the elimination of these defects will be welcomed by the farmers, to whom, it is said, it will mean an extra two or three hundred thousand pounds sterling annually.—"Agricultural News," Barbados.

The Orchard.

CANADIAN DRIED FRUITS.

Dried fruits (says "The Fruit World") form an important part of the daily life of the commercial world. As with butter, wheat, wool, tea, &c., there are the daily fluctuations of a great market, stretching from London to Australia, and it is thought that Australia has a bigger proposition ahead in the export of dried fruits than in the fresh fruit trade. The carriage is light, the article will keep in transit to any part of the world without refrigerators, and is a necessity of every retail grocer's establishment.

However, the position is well outlined by the following contribution from Canada:—

"The question of obtaining some returns from the unsaleable part of the apple crop is important to every orchardist. In many orchards a considerable portion of the crop is lost each year which might be turned into ready cash or at least fed to stock. When the crop is heavy and prices are low, this waste is especially great.

"Large quantities are dried in some districts.

"In the principal apple-growing sections this drying is done on a large scale, and growers who have great quantities of culls dispose of them to advantage by contracts with some of these evaporators. When the supply is great prices run as low as 1s. 6d. the 100 fruits.

"When apple-drying is done on a large scale, kilns in which 400 bushels or more can be done in a day are used. As a general rule only culls are used, but if the good apples are evaporated the finished product is of much better quality, and considerably more can be obtained from 100 lb. of apples. For this work the apples should be well ripened on the tree. Russets and Baldwins are the choicest varieties for evaporation. If properly worked they give about 16 lb. from 100 of apples.

"In a factory running 400 bushels a day, thirty girls are required to do the work. Eight machines peel and core 50 bushels each in a day, and these can be dried in one kiln. The girls trim off anything the peelers leave, and from the trimming-table the apples are sent in bushel boxes to the bleacher, where they are subjected to strong brimstone fumes. This treatment makes them soft for slicing, and prevents discolouration during the process of drying.

"Then the fruit goes to the slicing machine, and is cut into rings. These slices are spread 4 or 5 inches deep on the kiln, and the evaporation is completed in 10 to 20 hours, depending on the depth. They must be well turned two or three times. When dried, they are put in a heap in the curing-room, where they are left for two or three days, after which they are turned and aired, and allowed to 'sweat out.' After seven to ten days they are ready for packing. For shipment, two sizes of boxes are used—one holding 25 lb., and a smaller and more common one weighing 15 lb., and, for choice, pack 1-lb. and 2-lb. cartons. After being packed, ordinary storage suffices. Frost does no harm, and dampness makes them heavier. Too much heat makes them lighter unless they are packed when wet, in which case they sour and become like vinegar.

"Nothing is allowed to go to waste. The peelings and cores are dried by the same process, and packed tightly in barrels. This product is shipped to Germany and France, where it is made into jams, &c. Apples which are imperfect and too small for peeling are chopped and dried by similar process, and packed 275 lb. in a barrel. This barrelled product is sent to France, and when grapes are scarce it is used in making some of the strong beverages. The champagne which reaches the Canadian consumer at 13s. a bottle is made of this by-product from the evaporator."

Botany.

CONTRIBUTIONS TO THE FLORA OF BRITISH NEW GUINEA.

By F. MANSON BAILEY, F.L.S., Colonial Botanist.

ORDER ORCHIDEÆ.—Tribe Epidendreæ.

OSYRICERA, Blume.

O. ovata, *Bail., sp. nov.* Rhizome or creeping stems somewhat nodulose, slender, more or less covered by thin almost transparent scales. Leaves ovate, nearly sessile, 5 lines long, 3 lines broad, coriaceous. Peduncles erect, filiform, 6 lines long, purplish, enlarged at the base in a cluster of transparent bracts. Flowers deep-purple, expanding to a diameter of 3 lines, segments acuminate, the labellum very glandular. Only 3 flowers on the specimen received, all more or less imperfect, none with a perfect labellum. In form, size, and colour they closely resemble the Queensland species of the above genus, *O. purpurascens*, Deane, Fitzg., Austr. Orch; Queensland Flora, 1540.

Hab.: Ambasi, Brit. New Guinea, *Rev. Copland King.*

ERIA, Lindl.

E. ambasiensis, *Bail., sp. nov.* Upper portion of pseudo-bulb compressed, ½-in. broad, covered by membraneous sheathing scales. Leaves about 10 in. long, the lower 1½ in., somewhat twisted, forming a harshly winged petiole; lamina portion oblong, acuminate, about 2 in. broad near the centre; thin-coriaceous, longitudinal-nerves, about 20, for the most part very prominent in the dried specimen. Racemes lateral, about 10 to 11 in. long, of which the peduncle occupies about 2½ in. Bracts very numerous, ovate-acuminate, scarious about 3 lines long. Pedicel with ovary erect, straight, 8 to 9 lines long. Expanded flowers, scarcely exceeding 3 lines diam. Sepals ovate-apiculate, incurved, about 2 lines long. Marked with 3 longitudinal lines, glabrescent inside, scurfy on the back. Petals much narrower than the sepals, glabrous, lined like the sepals. Labellum attached to the elongated base of the column, the lower portion or winged claw and sagittate terminal lobe returned upon the elongate base of the column; terminal-lobe very dark-coloured. Margins undulate, scarcely longer than the sepals. Column short and broad. Anther cells white. The whole inflorescence clothed by a brown, short, dense scurfy-scarious covering, the small scales often almost stellate. The specimens received were about 2 in. off the apex of a pseudo-bulb, 2 leaves, and racemes.

Hab.: Ambasi, Brit. New Guinea, *Rev. Copland King.*

Tribe Vandeæ.

EULOPHIA, R. Br.

E. papuana, *Bail., sp. nov.* Pseudo-bulb a few inches high of 2 or 3 nodes, somewhat slender, clothed by the torn bases of the early leaves or scales, and bearing one or more leaves on slender petioles about 2 or 3 in. long. Leaf-blade or lamina lanceolate, 6 in. long, scarcely 1½ in. broad, 3-nerved, with numerous fine longitudinal veins between them. Scape from near the base of the pseudo-bulb, 20 in. high. Bracts narrow-lanceolate on the lower part of the scape and attaining 1½ in. in length, those subtending the flowers almost

filiform. Flowers about 18. Pedicels slender, with the ovary 6 to 9 lines long. Sepals and petals nearly equal, linear more or less falcate with filiform points, marked in the centre with 2 or more lines. Labellum scarcely as long as the sepals, broad, 3-lobed, lobes obtuse, the centre one smaller than the others, all closely marked by dark forked-lines, bearing on the face at its base a flat or a 2-parted leafy appendage. Column incurved half the height of the sepals. The gibbose spur at base of column more or less reflected.

Hab.: Ambasi, Brit. New Guinea, *Rev. Copland King*.

SACCOLABIUM, Blume.

S. Coplandi, *Bail., sp. nov.* Stem climbing, somewhat compressed, clothed by the bases of old leaves, which, being prominently nerved, give to the stem a corrugated appearance. Leaves distichous, 5 in. long, closely induplicate, scarcely ¾-in. when unfolded, emarginate, in the folded state appearing obtuse. The long aerial roots white and rigid. Inflorescence erect, rigid, flexuose in the lower part or peduncle, about 11 in. long. Bracts of the peduncle closely sheathing 2 or 3 at the base, and 3 distant ones higher up the peduncle, about 2 lines long, those subtending the flowers spreading triangular about 1 line long; raceme about 4 in. long. Pedicels with ovary about 6 lines long. Flowers numerous, slightly exceeding 6 lines diam., segments with prominent nerves. Labellum equal in length to the other segments. Spur incurved, blunt. Rostellum long, twisted.

Hab.: Ambasi, Brit. New Guinea, *Rev. Copland King*.

NOTE.—Some of the plants brought under notice belong to genera having very numerous species, and, as several of the New Guinea kinds have been described and published in Europe and these publications are not to hand, my names for the present in such cases should be taken as provisional.

THE DUAL-PURPOSE COW.

It is astonishing how hard it is for the older school of farmers to accept the new doctrines, which are often diametrically opposed to those of the old. Not long since, for instance, a producer admitted that it had taken him thirty years to get the idea out of his head that the dual-purpose cow was not the best for the dairyman, for the simple reason that he was governed by the notions of his neighbours, and did not think it worth while making an experiment. At length he bent the ear of submission to other sources of advice, tried a few of the recognised milk-breeds, and at seventy years of age he has made a discovery. There is some pathos in the lateness of the day in his case, but he offers an example to the scores of others who are blind to the strides science is making around them. The use of fertilisers and the need for fallowing wheat land provide another instance of the conservatism of farmers, including some of the very best pioneering men this country has seen.—"The Scotsman."

[Will it take as long to make some farmers in Queensland recognise the value of the silo? We heard of a farmer on the Downs who, during the late dry spell, although he milked fifty cows, had to be content with condensed milk for household use, as the cows gave scarcely enough milk to keep the calves alive. He had no silo, evidently.—Ed. "Q.A.J."]

Tropical Industries.

THE WORK OF THE SUGAR BUREAU.

The third annual report on the conditions, operations, and financial position of the Government central sugar-mills, issued in August last by the Comptroller of the Bureau of Central Sugar-mills, Dr. W. Maxwell, affords some very interesting reading. The report is voluminous, and, as was to be expected, bristles with figures. In the space at our disposal, we cannot enter into its every detail, but there are portions of it which are of general interest to, and which are well worthy of being carefully considered, by all who are interested in the central mills.

We are given the cheering information that seven of these mills have met all current liabilities, and, what is more, that their financial position has been improved in even a greater measure than is indicated by the bare payment of current liabilities. Taking the Marian Mill as an instance, that mill has repaid, in advance of its becoming due, £10,000 of its capital liability in addition to meeting all current redemption and interest payments.

The Racecourse Mill has entirely liquidated its obligations to the Treasury. The Pleystowe Central Mill and the Moreton Mill have also passed from the control of the Treasurer, and each is now owned and controlled by its own company. The former mill paid to the Treasurer an amount in total liquidation of its liability to the Government.

Four mills—viz., the Proserpine, Gin Gin, Mount Bauple, and Nerang Central Mills—still remain in the possession of the Treasurer, and certain proposals were placed before the shareholders, which we need not enter into here, by which the whole of the properties of those companies became absolutely vested in the Treasurer and his successors. The terms appear to have been very favourable to the shareholders, since all the lands previously mortgaged to the Government have been released, and the companies' total liability to the Treasury became extinguished. In connection with these arrangements, it is noteworthy that the great increase in the total volume of cane supplied to the mills in question was almost, if not solely, due to the increases produced by the "non-shareholding" suppliers. The "shareholders," after receiving the same or a higher current price for their cane than the "non-shareholding" suppliers, were to become the future owners of the mills, should they finally liquidate their obligations to the Treasury. The Comptroller points out that any further increase of cane supplies in the future must practically depend upon extensions to be made by new and non-shareholding producers. It is here where a grave injustice to the latter was to be remedied, and Dr. Maxwell solved the problem by submitting, *inter alia*, a proposition to the Treasurer, which justified the confidence that the policy of the Treasurer and the control of the mills had inspired in the great body of the shareholders in all the companies. Briefly stated, the proposition was, that, after the Treasury moneys had been totally repaid, new companies might be formed to include all cane-suppliers, and none other than cane-suppliers, and each grower's interest and share ownership in the mill to be proportional to his guaranteed supply of cane. The proposals were placed before the shareholders of each of the four mills in special meeting, the non-shareholding cane-suppliers being also invited to attend on account of their interest in the final settlement as indicated above. The proposals were accepted as the basis of a just and equitable settlement, the shareholders of each company frankly conceding that the proposals exceeded the mere equities of the situation, they being generously conceived in favour of the present and future interests of the cane-suppliers to the mills.

Now, without going into the intricate detail of the operations at each of the central mills, we turn to the summary table showing the financial position of each of them. This is a most interesting table, the perusal of which cannot fail to impress the reader with the conviction that great organising power, business and financial ability, and, above all, exceeding tact, have been brought to bear in carrying out the work of the mills since "annexation," as we may call the transference of the ownership from the companies to the Treasurer. The table clearly sets forth the financial operations of all the central mills in their relations to the State, and shows the rate and proportion of liquidation that has been made by each mill of its obligations to the Treasury. It has advisedly been resolved into two periods. Viewed in the light of the financial operations during these two periods, it will be seen that those operations and their result have a national bearing, inasmuch as very large sums have been repaid to the State in the shape of principal and interest during the second period, which appear to have been impossible during the first period.

The first period includes the space of ten years—from the establishment of the greater number of the mills in 1893 to 31st December, 1903—at which time the Treasurer entered into actual possession of six of them. The second period dates from 31st December, 1903, and relates to the three years between that date and 30th June, 1907, during which period the six mills in the possession of the Treasurer had been under the control of the Bureau of Central Mills. It should not be lost sight of that the first period covers ten years, and the second only three years, in order to realise the full significance of the figures and the remarkable success of the operations and financial management during the latter period.

I. PERIOD—(1893 to 31st December, 1903).

TABLE 1.

Mills.	Moneys Advanced from 1893 to December, 1903.	Moneys Repaid from 1893 to December, 1903.		Indebtedness to the Treasury (Principal and Interest), December, 1903.
		Principal.	Interest.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
*Racecourse	21,000 0 0	15,748 14 6	10,447 15 4	5,251 5 6
*North Eton	29,500 0 0	12,201 19 8	13,416 18 0	18,041 11 6
Double Peak	18,200 0 0	...	154 19 9	22,653 2 11
Marian	39,000 0 0	4,511 4 1	12,184 5 1	36,488 15 11
Plane Creek	65,000 0 0	7,493 3 5	10,762 9 11	67,492 1 9
Mulgrave	46,000 0 0	2,936 8 2	12,206 0 7	43,924 17 3
Mossman	66,300 0 0	4,232 5 6	17,868 11 2	62,067 14 6
Isis	38,636 0 0	9,067 2 5	8,725 11 11	29,568 17 7
Pleystowe	35,472 1 3	3,089 4 4	8,323 9 4	36,581 6 1
Proserpine	68,483 9 4	5,026 0 0	...	80,076 3 10
Gin Gin	52,000 0 0	...	6,914 14 10	61,476 10 3
Mount Bauple	32,480 16 1	508 3 9	4,169 15 8	38,301 16 8
Moreton	42,814 15 0	...	350 7 4	51,898 18 8
Nerang	19,998 18 10	...	839 0 0	26,589 5 2
Totals	574,886 0 6	64,814 5 10	106,363 18 11	580,415 7 7

* Racecourse and North Eton Mills were established several years prior to 1893, and repayments of capital with interest also began previous to that year. The remaining number have been erected during the course of 1893 forwards.

It is seen that eight of the thirteen companies owed more money at the end of those several years than at the date of their establishment; and that the total indebtedness to the Treasury on 31st December, 1903, was greater, in the amount of £5,529 7s. 1d., than the sum of the moneys that had been advanced to the mills.

II PERIOD (December, 1903, to June, 1907).

TABLE 2.

Mills.	Total Moneys Advanced from 1893 to June, 1907.	Total Moneys Repaid from 1893 to June, 1907.		Total Indebtedness to Treasury (Principal and Interest), June, 1907.
		Principal.	Interest.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Racecourse	21,000 0 0	21,000 0 0	10,834 6 4	...
North Eton	32,243 11 2	18,205 5 1	16,129 13 10	14,038 6 1
Double Peak	22,653 2 11	3,524 6 8	7,603 10 3	19,128 16 3
Marian	39,000 0 0	15,575 6 7	21,507 13 5	23,424 13 5
Plane Creek	65,000 0 0	16,064 16 2	20,359 14 3	56,970 9 0
Mulgrave	46,000 0 0	7,799 7 0	18,906 17 7	38,200 13 0
Mossman	66,300 0 0	11,236 18 10	26,285 3 5	55,063 1 2
Isis	38,636 0 0	12,812 17 2	12,127 18 10	26,352 16 9
*Pleystowe	35,472 1 3	35,472 1 3	16,698 3 10	...
Proserpine	68,483 9 4	12,301 2 3	9,498 4 3	70,462 15 10
Gin Gin	52,000 0 0	4,037 17 6	12,771 9 0	57,632 3 7
Mount Bauple	32,480 16 1	1,544 17 10	5,633 1 7	39,623 3 9
Moreton	50,214 15 0	50,214 15 0	13,726 2 10	...
Nerang	19,998 18 10	533 19 2	1,638 19 2	27,608 4 0
Totals	589,482 14 7	210,326 10 6	193,720 18 7	428,505 2 10

* A balance of £26,705 1s. 7d. on account of Pleystowe is guaranteed by the Queensland National Bank, and secured by that bank's general assets, and is therefore considered as repaid, thus making the third mill that has liquidated its total obligations to the Treasury. In the ownership and management of the Pleystowe Mill the Queensland National Bank now occupies the position formerly held by the Treasury.

From the two preceding tables is derived a brief statement of the moneys repaid to the Treasury, with interest, during the two periods, and the indebtedness of the mills collectively at the close of each of the two periods:—

Currency of Period.	Principal Repaid and Interest.	Indebtedness to Treasury.
	£ s. d.	£ s. d.
I. Period—1893 to December, 1903	171,178 4 9	580,415 7 7
II. Period—1903 to June, 1907	232,869 4 4	428,505 4 5

An examination of the data contained in Table 2 furnishes the indication that the largest liquidations during the "period" from December, 1903, to June, 1907, were made by the six mills that were in the possession of the Treasurer, and whose management was in the hands of the Comptroller of the Bureau of Central Mills. The following brief table shows in what measure the indication is correct:—

	£ s. d.
(A) By the Seven Companies managing their own affairs	98,016 5 11
(B) By the Six Mills under the management of the Comptroller of Central Mills ...	134,852 18 5
Total	232,869 4 4

The above figures speak for themselves, and show what possibly might have been accomplished by the old companies, and what has actually been accomplished by the mills under Dr. Maxwell's control.

THE DEVELOPMENT OF SISAL CULTURE.

We have to acknowledge, with thanks, the courtsey of the editor of the "Journal d'Agriculture Tropicale" for a special copy of this very interesting and valuable journal, to which we have frequently been indebted for articles on tropical agriculture, which we have translated and published in the "Queensland Agricultural Journal." The July number of the French journal contains an admirably prepared review of the two pamphlets on sisal culture published in Queensland—one by Mr. T. H. Wells, of Farnbro', Childers; the other by Major A. J. Boyd, issued by the Department of Agriculture, criticised by Mr. F. Main.

The writer draws attention to the ever-increasing numbers of publications relating to the cultivation of fibre plants. The periodical Press teams with articles urging colonists to turn their attention towards the cultivation of a plant which makes small demands on the grower, yet is extremely profitable. . . . . The Journal itself has kept its readers well posted in experiments made in certain regions where the cultivation of the agave presents itself under an aspect differing greatly from the published characteristics.

Can it be said that the question has made great progress, and that there is to-day less risk in undertaking the cultivation of the agave? Not absolutely; and if this culture offers, perhaps, less risks than another, the greater number of delicate points still remain to be elucidated. . . . To-day it is in Queensland that we have to note the almost simultaneous publication of two new pamphlets [Mentioned above.—Ed. "Q.A.J."] . . . . .

The pamphlet issued by the Department of Agriculture seems to put planters on their guard against too frequent cultivation of the soil, seeing that by too carefully reducing it to a fine tilth the result may be an increase in the size of leaf, with a decrease in the percentage of fibre, but it must not be forgotten that this work is often necessary, in the case of impermeable soils to avoid stagnation of the humidity, which is fatal to the agave. We know what is thought about poor soils for sisal plantations. Because the agave *may* thrive on such soils, it must not be concluded that they *must* be utilised to the exclusion of all others. This assertion is vigorously combated by Mr. Wells. . . . He confines himself, however, to the very just opinion that if a planter has very rich soil, it is better to reserve it for other crops which would not thrive on poorer land. As far as the height of plants to be set out, Mr. Main considers that about 11 inches represents a maximum height not to be exceeded. He doubts the probability of plants making a stand when more than double this size—that is to say, in their second year—in some districts. The distance between the plants is rightly stated to be regulated by the fertility of the land.

The yield of leaves and their defibration give rise, says Mr. Main, to some very interesting figures, but the authors give expression to some statements which are disputable. It appears to him that Mr. Wells is far above the mark when he states that a labourer can cut 2,500 leaves a day. With 1,200, Mr. Boyd comes close to the figure of the Afro-American Company, de Voi (East Africa), where of all industries newly established the greatest attention is paid to economic work.

With respect to the drying of the fibre after leaving the machine, the critic notes that both authors state that the fibre is still greenish in hue, which necessitates two days in the shade before exposing the fibre to the sun. Mr. Main is slightly in error here. Mr. Boyd distinctly states in his pamphlet: "As soon as a leaf is cleaned, the fibre is removed and hung up for a couple of hours in the sun to dry and *bleach*." He recommends, however that the fibre be hung up in the shade for a day or two before *baling*. One very important point Mr. Main would like to have cleared up is the question as to whether fresh water is absolutely necessary for washing the fibre, or

whether salt water would serve the same purpose without injury to the fibre. This is, he says, a most important problem for certain countries where fresh water is scarce.

This is a problem which Mr. Boyd is now engaged in solving, and the results will be published as soon as the experiments are completed.

Finally, Mr. Main advises intending planters to read the preface to Mr. Wells's pamphlet, as it contains a dozen lines which alone are worth the somewhat high price of the brochure (5s.).

THE LANDOLPHIA RUBBER VINES.

By IVOR ETHERINGTON.

(From "The Tropical Agriculturist," August, 1907.)

During the year 1906, of a total world's output of rubber, of about 65,000 tons, no less than about 17,500 tons were produced by tropical Africa; and, as the far greater portion of this African rubber is obtained from climbing rubber plants or *lianas*, the importance of this class of rubber-producing plants is evident. The natural order of plants which produces the greatest portion of the world's rubber supplies is the Euphorbiaceæ, and next to this in importance ranks the order Apocynaceæ, in which are included many of the African rubber-yielding species, such as the Landolhpia, Clitandra, Carpodinus, &c. The rubber produced from these three is obtained from their long climbing or creeping (underground) stems, the Landolphias especially providing most of the so-called vine-rubber. The Landolphias produce the best of the vine or creeper rubbers, and the product, though not of the same class of rubber as that of the Hevea tree, is quite a good rubber, but fetches low prices in the markets of London, Antwerp, &c., because of the dirty and adulterated condition in which it is sent. If the African Landolphia rubber were carefully prepared, there is no doubt that an excellent article could be produced. The French Government authorities have made experiments in the coagulation and manufacture of these rubbers, and in a report state: "The experiments were made with aseptised latex, and brought about the coagulation of rubber of the very first quality" ("Revue de Cultures Coloniales," 1899).

The latex in some Landolphias flows very freely on the bark being cut, and Monsieur Hamet, who carried out the experiments in Africa just referred to, gives five methods of coagulating the latex. Speaking more particularly of *Landolphia Heudelotii*, he says that during coagulation the latex is observed to consist of two parts—(1) the liquid containing the rubber proper with albuminoid matter and a vegetable wax; (2) the serum which contains the constituent water, mineral matters, and azotized matters, which the rapid fermentation of the latex carries off before any coagulation takes place. These matters, if retained in the rubber, tend to deteriorate it, and it is absolutely necessary to destroy these fermentable agents either before or during coagulation. Fuloride of sodium, he says, does both these at the same time, as it is antiseptic, and coagulates the rubber when used in the proportion of 2 per cent. of the weight of the latex. Other processes of coagulation were:—(1) Mechanical, (2) heat, (3) smoking, (4) chemical agents, (5) decoction of local native plants. All these gave good results, especially the last two methods. The yield seemed independent of the method of coagulation employed, and varied from 28 to 32 per cent. Among the chemical agents used were sulphuric, oxalic, and citric acids, marine salt, &c. (We might suggest here the experiment of coagulating Hevea rubber by the use of fluoride of sodium, to determine whether its antiseptic qualities would have any good effect on this rubber.)

There are twenty-one species of Landolphia known, and specimens of two or three can be seen in Ceylon, in the Botanic Gardens of Peradeniya and Henaratgoda. The best known are *Landolphia owariensis, L. Kirkii, L. florida,*

and *L. Heudelotii.* *L. owariensis* is found in the various countries of West Africa, extending from about 10 degs. north to about 10 degs. south of the Equator, and is said to be most abundant in the highland districts of Angola, in Portuguese West Africa. *L. florida* is found extensively in Portuguese West Africa, in East Africa, in Uganda, and in Liberia. *L. Heudelotii* is specially found in Senegal. But these species are by no means confined to the countries mentioned. Dr. Kirk states that *L. owariensis* is found along the maritime region of East Africa, and is abundant in the lower Zambesi basin. *L. Kirkii* is found in various parts of East Africa, and it is stated by one authority that Landolphia species are indigenous to all parts of tropical Africa. *L. Kirkii* is considered to produce the best of the East African rubbers.

There are also several Landolphias in Uganda, including *L. Ugandensis*, *L. Dawei*, and *L. subturbinata*, and all recently described and noted by Mr. M. T. Dawe, who made an extensive tour through the unknown parts of Uganda, and published a useful report on the economic products of the country; in this tour he discovered *L. Dawei*, *L. subturbinata*, and *L. Ugandensis*, the first of these being an important rubber producer. According to Speke and Grant, *L. florida* is also a first-rate rubber producer.

Of the general characteristics of the Landolphias, it may be said that they are huge climbing plants, twining round and ascending the great trees of the African forests to reach the light. In consequence of the dense shade in the forests these climbers have little foliage on the lower parts of the stems, but carry their leaves, flowers, and fruit on the young stems growing in the light at the tops of the trees on which they climb. Mr. S. P. Hyatt, who has considerable knowledge of the Landolphia in the Mozambique country, says its ideal home is the densest shade of the great forest trees. The best trees are tall, with wide-spreading branches forming more or less umbrella-shaped tops, and the higher the trees the better for the creepers. The Landolphia dislikes undergrowth, and especially grass. The young vine can be twisted and trained about in any direction and shape, and grows to tremendous lengths; the longer the vine before it reaches the light the better, as it then stops growing. The vines in the forest assume most fantastic shapes; sometimes a vine grows up to a considerable height, and then turns and grows down to the ground, twisting and curling round itself. At other times one sees a vine that has grown round and round the stem of a young tree which, as it has grown, has overlapped the rubber plant until the two are practically grown together, the creeper being almost entirely embedded in the trunk.

Hyatt gives the following vivid description of the Landolphias in their natural conditions:—"The first condition necessary for the Landolphia is shade—semi-darkness, perhaps, would better describe it. The small creepers will grow in the dense thorn jungle; but for them to attain any size, large heavy-foliaged trees are necessary—trees which throw out no small branches on the lower part of the trunk, but have their whole foliage at the top, where their boughs join in a dense, almost impenetrable screen, through which only a stray gleam of sunlight can break here and there and throw a dazzling spot of light on the whitish-grey soil. There is no undergrowth of bushes, no grass, for this rubber needs the lightest, loosest sandy loam. . . . Generally there is a tangled mass of different varieties, great and small; some the size of a man's body, crawling over the ground in slimy-looking contortions; others, spotted green and yellow, coiled tightly round a tree trunk like some giant snake. . . . The impression given is indescribable. The gloom and the silence, the loose, fine sand, in which one's footsteps make no sound; the utter absence of animal life; the tall trees meeting overhead; and everywhere the weird tangle of various coloured creepers, trailing on the ground, twisting round on themselves and on each other, cutting deep into the trunks of growing trees, round which they coiled years ago, hanging like great cables from branch to branch, or rearing themselves into arches which look as though a touch would send them over—all these combine to produce an effect which can never be forgotten."

Plate XXVII

Landolphia Rubber Vine.

Another writer describing the Landolphia says:—"This plant is a woody climber, growing well in places where little else could be profitably grown. Its trunk often travels along the ground, looking like a large boa-constrictor, until it meets with a trunk to climb up. The stem attains a diameter from 6 to 8 inches at a few feet from the ground, and then soon divides into more slender branches, which ascend to the top of the tree and throw down long pendulous branches and clusters of snowy-white flowers."

These descriptions of the plants in their native habitats appear to be truthfully recorded when comparison is made with the growth and appearance of the few Landolphias growing in the Botanic Gardens of Henaratgoda and elsewhere in Ceylon. As the accompanying photograph shows, the stem twines and twists in fantastic shapes, and the sunlight falling in chequered pattern of light and shade on the stem gives the appearance of some weird snake. The specimen, photographed about five years ago, is the largest Landolphia in the Henaratgoda Gardens, and is possibly *L. Kirkii* (as mentioned in the late Dr. Trimen's reports). It bears flowers in abundance, and seems to fruit yearly. The exterior bark of the old stem is somewhat rough with longitudinal furrows, the inner bark is stringy and purplish-pink in colour, with pinkish-white wood. If the outer bark is scraped and a light incision made, the white latex immediately gushes forth, but spontaneously coagulates almost directly; if tapped during the heat of the day, the latex coagulates immediately it issues from the bark, and turns at once into little lumps of soft white rubber, which, on being pulled, form into a long elastic thread reaching right into the inner bark tissue—a remarkable phenomenon. This rapid coagulation is also remarked on by those who have exploited the rubber in Africa. Mr. Hyatt says:—

"The method of collecting the rubber is simple, though tedious. A thin slice of bark, several inches long, is taken off with a knife, and as the white latex oozes out in little globules these are rubbed over the surface of the cut with the finger. In a few seconds the latex has coagulated into a thin film of rubber, which is wound on to a twig. The process is repeated all over the creeper, the first film forming the nucleus of a ball of rubber. The tapping is repeated four or five times during the wet season, fresh bark being removed each time. If the process is carried out carefully, and a sufficient quantity of bark left at the end of the tappings, the creeper is unharmed; and by the end of the dry season a new bark will have formed."

This certainly seems to be a slow and tedious process, and probably is practised only in certain parts. According to Speke and Grant, every part of the stem exudes a milky latex when cut, and this dries so quickly as to form a ridge on the wound, which stops its further flow. The natives collect it by making long cuts in the bark, and as the latex flows it is wiped off continually with the fingers and smeared on their arms, shoulders, and bodies, till a thick layer of rubber is formed. This is peeled off their bodies, and cut into small squares, which are then boiled in water. This statement is confirmed by Dr. Welwitsch, who visited Angola and reported on the industry there. In some parts the latex is collected in wooden vessels and allowed to inspissate. Christy suggested collecting the rubber stems, crushing them between rollers, and treating the whole mass with carbon bisulphide, which dissolves the rubber, but not certain gummy substances which, according to Collins, are found in the latex if the tapping cuts are made too deep. Coagulation by boiling is also practised, and by the use of acid juices of various native plants. Formerly the African rubber was much adulterated, but more careful Customs inspection and stringent regulations by the French authorities are stopping this.

Mr. M. T. Dawe says regarding the coagulation of Landolphia rubber (*L. owariensis* particularly):—"On boiling it readily coagulates. This is best done in an enamel vessel placed within another, the water in the outer being maintained at boiling point. On coagulation it should be subjected to pressure, and when dry is ready for market. *L. Heudelotii* is usually treated by coagulants, such as salts and acids, acetic acid being one of the best, and apparently

the more permissible. It can also be coagulated by allowing it to stand for a few days without any treatment whatever, and a very good rubber is produced in this way, which, if found practicable on a large scale, would be the preferable method. These latter processes yield what is termed in commerce a wet rubber, and a screw or hydraulic press is almost an indispensable requisite in order to get rid of superfluous moisture immediately after coagulation has been effected." The coagulation methods mentioned above, as recommended by Mons. Hamet, are also to be noticed.

The Landolphias are easily propagated from seed. Mr. Dawe says that, as the plants are somewhat averse to transplanting, seeds should be sown where the vines are intended to grow—*i.e.*, at the base of a large tree. They should be sown as early after being procured as possible, for they do not retain their vitality for any lengthy period. Propagation by cuttings is also mentioned as practised in Africa by some writers. Hyatt says that in the Mozambique country the Landolphia is spread naturally by the seeds being carried in the droppings of wild elephants.

Landolphia is not a rubber for the planter, especially in the East; but in Africa the industry is an important one, and the planting of the vines, more or less under cultivation, seems to be advisable. Landolphias are growing successfully on a few estates in Ceylon besides those in the Botanic Gardens, where they were introduced in 1877 or 1878. On Doteloya Estate, at 2,500 feet elevation, *L. Kirkii* is growing luxuriantly. The same species was formerly cultivated on Kennington and Yatawella Estates, Ruanwella district; in 1886, rubber and samples of the thick stems of these creepers were exhibited at the Colonial and Indian Evhibition, London, and rceived a silver medal award. Some planting of Landolphias has of recent years, we believe, been done experimentally on Greenwood Estate, Galagedera.

[We were informed by Dr. Christy, who is in charge of the great rubber concession in Uganda, that Landolphia biscuits had been sold at as high prices as Para biscuits. The great disadvantage, which renders it an all but impossible plant to cultivate here, is that it is a giant creeper, and needs large trees to twine upon.—Ed. "T.A."]

FIBRE CULTIVATION.

SISAL AGAVE AND FOURCROYA GIGANTEA.

By CESAR ROSITZKY, Port Shepstone.

In consequence of the many inquiries received lately relative to the cultivation and preparation of fibre, at the request of the Department of Agriculture I am embodying the results of my studies, experiments, and experiences in the form of an article for this journal.

Most of my information, in the first place, I received from books and periodical literature, and by correspondence with various planters and others interested in fibre. Later on I visited plantations in German East Africa, where fibre-growing is now an established industry.

Agave Sisalana.

The Sisal agave is grown principally in Yucatan, from the port of which—Sisal, where most of the fibre is shipped—it derives its specific name.*

I have received information from there, as well as from the Bahamas; but, as the methods are all very much the same as those in vogue in German East Africa, I will relate only what I saw and heard there on my visit in May, June, and July of last year.

* Sisal is now shipped only from the Port of Progreso.—Ed. "Q.A.J."

The plantations there are mostly in the hands of large companies, but already the small capitalist is beginning to invest in this business, and the outlook is apparently promising.

The Sisal agave grows best on dry soil containing plenty of lime. The plant is propagated either by shoots or bulbs, but the former are preferred. There is no cultivation of the land. The bush is cut down and grass burned, and the plants are then put in 9 x 9 feet, or about 600 to the acre. The fields are kept weeded during the first two years; after that period the plants are strong enough to keep the weeds down themselves.

When the plants are three years old, reaping begins. The leaves are cut and the fields cleaned, and new rows are planted between the old rows, in order to keep the plantation going. The planter only reckons upon three crops in all from a plantation. After that the plant "poles" and dies.

Every plant gives about 40 leaves yearly. It is advisable to cut only such leaves as hang at an angle of more than 45 degs. away from the stem. The leaves are taken to the mill, which should be placed as central as possible in order to save transport and labour, for the leaves are very bulky and heavy, each weighing from 2 to 4 lb.

The mill, or decorticating machine, which appealed to me most consists of a number of common raspadores fixed to a shaft. These raspadores consist of large wheels of about 3 feet diameter, and 12 to 18 inches face (on which the beating knives are fastened), and a sort of feeding table. On each side of the table stands a native, who introduces one half of a leaf into the machine, and allows the knives to beat off the flesh; then he pulls the leaf out, turns it over, and repeats the procedure with the other end. At each raspador two men do the milling, two boys keep them in raw material, two boys carry the fibre away, and one man scrapes the refuse from under the machine. Thus seven men can do about 5,000 leaves per day of ten hours. Of course one may have as many raspadores (each served by seven men) to one shaft as one requires. A double raspador is reckoned to require 5 h.p. A recent improvement on the raspador is a pair of crushing rollers to flatten the thick end of the leaf, and an arrangement to throw out the leaf at a certain point, so that the worker need not push or pull, and can work a leaf in each hand, and so double the output.

If there is sufficient work, a planter should invest in a large machine, such as the "Corona," the "Condor," or the "Matador." These machines work automatically, and strip from 50,000 to 150,000 leaves per day, requiring only six men. To do the same number of leaves in a day on ten raspadores it would take some seventy men.

The Condor and the Matador have elevators and hoppers to feed them, so that the leaves need only be thrown in by the armful at one end of the machine and the fibre comes out hanging neatly over a rail on the other end. With the Matador trucks and rails are supplied, and the machine deposits the pulp into one truck and the fibre into another, so that only very few hands are required. The latest improvement with this machine is a complete plant for sending the fibre in a truck to be washed immediately, and from there to a drying apparatus, and next to the baling press, so that fibre can be cut in the morning and be on the train the same day, in spite of any amount of rain.

No doubt our natives are very lazy and very expensive, so that we should use as much labour-saving machinery as possible. I consider it wise even for a small plantation to use a large machine, if capital permits, because the crop comes in so much quicker, and plenty of time is left to extend the plantation with the same amount of labour.

The great question is, of course, always the same—

Does Fibre-planting Pay?

I will give a few figures as I have them from different parts of the world, and from them readers can calculate for themselves what the prospects are. I

suggest that we should *cultivate* the land for fibre; then our cost would be, say, for 100 acres:—

	£
Land price, at 10s. per acre	50
Ploughing and harrowing, at 20s.	100
60,000 plants, at 6s. per 1,000	18
Planting	7
Weeding for two years, say	30
(This should be paid for by catch-crops.)	
Total	£205

60,000 plants should yield —

	lb.
The 1st year, 3 lb. each	180,000
The 2nd year, 1¾ lb. each	105,000
The 3rd year, 1 lb. each	60,000
Total	345,000
Or some	150 tons dry fibre
Which would fetch in England £42 per ton, or ...	£6,300

From this must be deducted the cost of reaping, milling, transport, freight home, agency, &c., at, say, £10 per ton, £1,500. This would leave a net profit of £4,800 for 100 acres for three years, or £16 per acre per annum.

Whilst all this is proved for Sisal fibre, it is not so easy a matter to furnish information on

Fourcroya Gigantea or Mauritius Fibre.

The fact is, nobody can give reliable figures. We can only compare, for we have no plantations yet of any extent and in regular reaping, from the results of which we can judge.

We hear from Mauritius that there the yearly crop per acre is about a ton, and that the aloes are planted 4 x 4 and 5 x 5 feet. We hear also that the same aloes grow considerably larger on the African coast than in Mauritius, and therefore, I think, we may safely reckon upon a ton of fibre per acre in Natal.

In German East Africa, *F. gigantea* was planted at first, and enormous plants were obtained (I have seen leaves 15 feet long and 12 inches wide); but when it came to reaping it was found that the leaves contained only ¾ per cent. of dry fibre. All the plants were, therefore, destroyed, and the Sisal agave put in their place; this yielded leaves 4 to 5 feet long, with 3 per cent. of dry fibre.

I believe that the coast lands in German East Africa, which are almost under the Equator, are too hot and too rich for *Fourcroya*. A certain small lot grown on the higher land inland, and crushed on one of the plantations, proved to contain 3¾ per cent.

I have crushed many leaves, and have experienced most bewildering results. I have cleaned aloe leaves from this district which were 7½ feet long, weighed 6½ lb. each, and gave 12 oz. of dry fibre, equalling 12 per cent; and, again, 3½ year old leaves, which were 6½ feet long, weighed 4½ lb., and gave only 4 oz. of dry fibre, equalling 5½ per cent.

No doubt rich land produces large, rank plants with large leaves, but these large leaves yield no more fibre than smaller ones. They weigh a great deal, and consequently their percentage of fibre is naturally low.

I have planted *Fourcroya*, and I reckon that I shall get from 700 plants to the acre (7 x 9 feet) and about 22 leaves per plant, weighing 4 lb. each and yielding $3\frac{3}{4}$ per cent. of fibre,

$$\frac{700 \times 22 \times 4 \times 3\frac{3}{4}}{100}$$

equalling 2,310 lb., or, roughly, 1 ton,
which is worth in England on an average, according to the last twelve months' price lists, which I receive regularly, £32.

Supposing that the cost of reaping, milling, transport, freight, agency, brokerage, &c., will be about £12, then I shall have £20 net profit per ton or per acre, and that very likely for some years, because the *Fourcroya* seems to live longer than the Sisal. I quite expect, however, that the yield of *Fourcroya* will also fall off to a certain extent after the first crop. But that is of no consequence, as with such results we shall simply extend the plantation, and so increase our income.

Sisal fibre fetches a higher price per ton, but I expect *Fourcroya* to yield a larger crop, and through that to pay better. Although it is not proved, I consider good results certain with *Fourcroya*.

There remains only one important matter to deal with, and that is the question of the

Most Suitable Machinery.

As I have said before, Sisal leaves are from 4 to 5 feet long, weigh about 3 lb. each, and contain rather thick, strong fibre. *Fourcroya* leaves may grow 10 feet long, weigh up to 6 or 7 lb. each, have a very thick lower end, and the fibre is thinner and weaker than the Sisal fibre and more liable to break in the machine. The consequence is, that we can very well crush Sisal leaves on machines made for *Fourcroya*, but by no means must we take for granted that all machines which clean Sisal leaves well will also be suitable for *Fourcroya*.*

I have seen many machines and have also worked them; and I have come to the conclusion that, for *Fourcroya* plantations of any extent, the large Corona and Matador machines, which save labour and work with a minimum of waste, should be chosen, and for small plantations the simple raspador or "gratte," as it is called in Mauritius. Both words mean "scraper."

I repeat that all *Fourcroya* leaves of any size have a very thick lower end, some 3 to 4 inches in diameter, and that these ends must be crushed flat before the leaf goes into the machine; otherwise the fibre contained in that end is simply beaten off and lost. That crushing means, of course, a special machine for large concerns, and at any rate extra handling and consequently extra expense.

Only the Matador has a crusher combined with the mill. The leaves thrown by armfuls (not leaf by leaf) into the elevators, are turned into the hopper, come out from there singly, pass the crusher, and go into the elevator, all automatically. Below the decorticator stands a truck, to receive all the pulp and refuse. The fibre runs into another truck, in which it goes to the wash, from there to the drying apparatus, and then to the baling press, with very little handling.

* The "Lehmann" and the "Death and Ellwood" Raspadors used in Queensland were found quite equal to cleaning Sisal, Fourcroya, and Sansivieria leaves.—Ed. "Q.A.J."

I shall now give a few hints regarding machinery plants for different-sized plantations:—

20 acres, equalling about 300,000 leaves, to be reaped in 90 days—

	£
Single raspador, say	60
Horse-gear, say	25
Crusher (a wooden hammer will do)	
Polisher	40
Press	20
	£145

50 acres, equalling about 750,000 leaves, to be reaped in 100 days—

	£
Double raspador	140
16 h.p. gas suction engine (allows for a second double raspador to be added when required)	420
Crusher	60
Polisher	40
Press	45
	£705

200 acres, equalling 3,000,000 leaves or more—

	£
Decorticator, Matador	600
25 h.p. gas suction engine	546
Double polisher	72
Hydraulic press	150
Five trucks, rails, pump, tank, drying apparatus, &c....	300
Shed, &c.	332
Say, in all	£2,000

All these are, of course, approximate prices, although they will not be very far out.

SISAL EXPORTS OF THE BAHAMAS.

The "Agricultural News of Barbados" says:—

Mr. A. W. Cunningham, curator of the Botanic Station, Nassau, reports that the exports of sisal hemp from the Bahamas during the first six months of this year totalled 5,584 bales as against 3,954 bales shipped during the corresponding six months of 1906. The value of the hemp is roughly estimated at about £5 per bale.

We are, unfortunately, not told the weight of the bales. But, supposing them to be of the convenient size of 250 lb. each, the total weight would be 698 tons. At the price per bale given—viz., £5—the selling price would be £40 per ton, or a total value of £27,920.

CAMPHOR.

Amongst "neglected industries" in this State may be included camphor production. The camphor laurel grows so well, not only on the coast, but also on the tableland, that some think it would be a very paying speculation to plant forests of this tree. The arguments are, that the tree thrives in most

parts of Queensland, that it requires no attention, that camphor is exceedingly high in price, that large quantities are used in the manufacture of smokeless powder, and that the Japanese Government has the monopoly of camphor production in Formosa.

Dr. J. C. Willis, Director of the Royal Botanic Gardens, Peradeniya, Ceylon, writing about camphor in the July number of the "Tropical Agriculturist and Magazine of the Ceylon Agricultural Society," recommends this cultivation as a very decided "second string"—a product well worth cultivating on a very small acreage, but one which should on no account be the main product of an estate, until the position of the camphor market and the prospects of artificial camphor are more clear. His reasons are that, though camphor is now three times above its normal price, it is not an industry on the same footing as rubber—*i.e.*, if 25,000 acres were planted with it in Ceylon the world's demands would be met. He considers that the present high price is due to temporary causes, and that it will fall in a year or two; or, if it does not fall, that artificial camphor will probably compete successfully with the planting industry. He argues, however, that "an important reason why Ceylon should grow camphor, though one not likely to appeal to the planter, is that it is required in the manufacture of smokeless powder, and England should not be dependent on other nations for this."

COTTON AT THE STATE SCHOOLS.

We have received from Mr. D. Jones, of the Agricultural Department, some particulars of a plot of cotton planted by the pupils of the State school at Wallumbilla, which show what can be done by young people under careful instruction. The plot had an area of 250 square yards, equal to about one-nineteenth of an acre, and the number of plants was equal to about 2,128 per acre. Of the 112 plants, about 83 grew and throve, yielding: Russell's Big Boll, ½-lb. per plant; Griffin's, ½-lb.; and Seabrook Sea Island, ⅓-lb. per plant. The seed was sown on 25th October, 1905. On 30th November, flower buds appeared; on 25th January, 1906, the plants were full grown and in pod, and the pods began to burst on 14th February. Cotton-picking was carried on from that date to 30th June, and three small bales were sent to the National Association's Exhibition, where the cotton gained the first prize of £2 2s. offered by Messrs. Kitchen and Sons for the best cotton grown entirely by State school children.

It is a pity the cotton was not grown on field conditions—that is to say, planted at the usual distances allowed for different varieties. A farmer would plant ordinary Uplands at distances of 4 feet by 16 inches, which would mean 8,034 plants per acre, yielding, at ½-lb. per bushel, 4,017 lb. of seed cotton, worth, at 1½d. per lb., £18 17s. 1½d., provided the crop were perfect; larger varieties, 4 feet by 20 inches, giving 6,531 plants per acre; and Sea Island, 4½ feet by 4½ feet, giving 2,151 plants per acre.

These experiments at the State schools are most valuable, as, not only do they afford the school children good and wholesome instruction, but wherever cotton has been grown at a State school the work has been closely watched by the neighbouring farmers, many of whom have, as a consequence of what they have seen, entered upon the cultivation of cotton, much to their own benefit. We congratulate the head teacher of Wallumbilla on the success of his scholars' work, and would suggest that very careful note be made of the date of bearing of the pruned cotton plants as against the seedling plants, as this is a very important matter.

Chemistry.

ANALYSES OF COMMERCIAL FERTILISERS.

TAKEN AND ANALYSED UNDER "*THE FERTILISERS ACT OF* 1905."

Fertiliser.	Where Obtained.	Moisture.	Phosphoric Acid P_2O_5.			Potash, K_2O.	Nitrogen, N.	Mechanical Condition.			Remarks.
			Water Soluble.	Citrate Soluble	Total.			Coarse.	Medium.	Fine.	
Simple Fertilisers: Nitrogenous Manures.											
		%	%	%	%	%	%	%	%	%	
Ammonium Sulphate ...	South Brisbane Gas and Light Company	2·71	...	...	...	...	19·81	...	...	...	93·5% Amm. sulphate
Ditto ...	Brisbane Gas Company	2·27	...	...	...	...	19·64	...	...	...	92·5% ditto
Bone, Blood, Meatworks Manures.											
Bone Dust	Baynes Bros., Brisbane	7·95	...	...	24·39	...	3·59	90·8	3·8	5·4	
Ditto	C. F. Jordan, Zillmere	6·19	...	...	27·61	...	2·86	65·2	9·2	25·6	
Ditto	Queensland Fertiliser Company, Runcorn	7·23	...	...	22·25	...	3·44	50·0	22·0	28·0	
Fertilisers, Q.M.E.	Jack and Newell, Cairns	7·92	...	...	16·11	...	6·27	69·3	19·7	11·0	
Mixed Fertilisers, Guano, Etc.											
Ohlendorff's Guano	Gibbs, Bright, and Co., Brisbane ...	1·96	10·15	...	12·25	4·66	6·08	...	...	...	

NOTE.—These samples were taken by inspectors under "*The Fertilisers Act of* 1905," in addition to the analyses of samples already published in the August number of this Journal.

J. C. BRÜNNICH,
Agricultural Chemist.

Animal Pathology.

THE INOCULATION OF CATTLE AS A REMEDY AGAINST CONTAGIOUS DISEASES.

In the "Agriculture Gazette" of Nagpur (Central Provinces), we find a very interesting paper on the above subject by Kumar Jethiji, M.R.C.V.S., Superintendent of the Civil Veterinary Department, Central Provinces.

The paper first deals with the methods by which disease may be spread from one animal to another. It may result, the writer says, from the diseased animal coming in direct contact with other animals; or it may be carried through the air; or it may be communicated by soil, fodder, manure, or some other article which has been in contact with the diseased animal. The writer then deals with contagious epidemics, susceptibility, and immunity. This immunity, or the power of resisting a disease in animals, is of two different kinds, viz.:—(*a*) Active Immunity, and (*b*) Passive Immunity. Of the Active Immunity there are, again, two kinds—(1) Natural Immunity, and (2) Acquired Immunity. Natural Immunity is really what may be called inherited immunity, and in this case the animal is found to be immune even at the time of birth. The second kind of immunity is acquired by the animal having gone through a natural attack of the disease, or by its being artificially made to go through the attack of a disease by the introduction into that animal's system of either the micro-organisms or the virus of that disease in such a manner as to cause only a mild attack and an easy recovery.

Passive Immunity is obtained by supplying to the animal's body certain substances (not containing the organisms or the virus of the disease, as is the case with vaccination), the presence of which in the body brings on the power of protection against certain diseases. In this case, the immunity is of a weaker degree, and lasts only for a very short period as compared with active immunity. . . . In inoculation, there being no virus or germs of the disease of any kind present, the animal inoculated feels no sort of discomfort save the pain caused by the insertion of the needle. The inoculation treatment may be practised on cows actually in milk, and also on pregnant animals, without risk of any kind; and often for the same reason, when the disease is raging, animals are inoculated while they are actually yoked in the team, without interfering in the least with their daily work; it causes no discomfort to the animals, and, consequently, no sort of special care is required after the operation.

The period of immunity is at its strongest up to the third month, after which it gradually declines; so, if there be a recurrence of the disease after six months, it would not be surprising if some of the inoculated animals were to get an attack of the disease, but even then, very often, the attack is of a mild nature. But, for practical purposes, the period of three to six months is quite long enough to protect animals through an outbreak, particularly so with the disease rinderpest, which very seldom lasts in a place for so long a time. . . . . Another point which requires mention is that it should be clearly understood that the inoculation treatment is a preventive measure, and not a curative remedy. Cases have occurred where a few animals seem to get an attack of the disease soon after inoculation; this can be explained by the fact that, at present, inoculation is practised only at a time when the disease is actually rampant.

The names of the contagious diseases of cattle against which inoculation and vaccination are being practised in the Provinces are—rinderpest, hæmorrhagic septicæmia, anthrax, and black quarter.

Whenever an outbreak of such a disease occurs, the aid of the veterinary staff should be sought, but it is to be clearly understood that inoculation will be done by the veterinary officer only when it is expressly desired by the owners of the cattle.

[Here, in Queensland, inoculation is not compulsory, and will only be carried out in the case of small herds by the veterinary officers of the Department at the request of the owners, and as the charge for the work is only 3d. per head small lots have to be collected at some convenient central spot. Where large herds are concerned, the inoculation is carried out on the run by a veterinary officer on requisition, and on payment of the fee.—Ed. "Q.A.J."]

Science.

NEW METHOD FOR DETECTING THE PRESENCE OF HYDROCYANIC ACID IN PLANTS.

During a study of beans yielding Hydrocyanic acid, Guignard announces the discovery of a new method of detecting the presence of Hydrocyanic acid in plants.

The Experiment Station record, March, 1907, p. 627, has the following:—

"It is based upon the action of Hydrocyanic acid in changing to a red colour a mixture of picric acid and an alkali through the formation of isopurpuric acid. Strips of blotting paper are soaked in an aqueous solution of picric acid dried, impregnated with a solution of carbonate of soda and again dried. A strip of this paper suspended in a test tube containing 1 or 2 c.c. of liquid containing hydrocyanic acid will after a time take on an orange-red colour, afterwards changing to red, the rapidity of colouration depending upon the temperature and amount of acid in the solution. A solution containing 0·005 mg. of hydrocyanic acid will change the paper to red in twelve hours and 0·002 mg. will be indicated within twenty-four hours."

Guignard also records that "Practically all varieties of *Phaseolus lunatus* whether wild or cultivated were found to contain the principle which when acted upon by an enzyme yields *Hydrocyanic acid*.

Answers to Correspondents.

PRAIRIE GRASS.

J.R., Gympie.—The specimen you send is Prairie Grass, one of our best winter fodder grasses. It will not stand the summer heat well, although it will resist drought better than almost any other grass.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.				1907.								
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
North.													
Bowen	3·41	1·76	0·99	11·01	2·53	3·74	1·97	0·39	3·46	2·87	Nil	1·28	0·51
Cairns	1·57	0·56	13·26	11·31	18·36	11·49	3·26	3·35	8 65	4·45	0·12	0·39	1·35
Geraldton	4·26	2·28	21·08	21·20	29·58	25·26	4·58	6·08	21·91	8·54	2·39	4 66	1·36
Herberton	0·38	0·30	5·16	10·82	10·56	11·77	2·05	0·90	1·57	2·71	Nil	0·11	0·12
Hughenden	0·92	0·61	0·51	4·76	1·98	3·83	1·17	0·16	1·34	0·95	1·16	Nil	Nil
Kamerunga State Nurs.	2·56	0·72	10·00	8·17	15·78	14·82	4·87	2·80	9·33	5·29	0·13	1·15	†
Longreach	4·11	2·16	0·66	0·51	1·22	0·49	1·88	0 85	0·93	0·40	0·49	0·04	Nil
Lucinda	Nil	1·85	6·60	*22·36	12·38	23·82	4·53	3·92	19·29	6·34	0·29	1·05	1·19
Mackay	4·35	2·63	1·80	12·93	2·72	6·42	8·01	1·58	6·09	5·04	0·27	0·25	0·12
Rockhampton	3·80	1·07	0·46	5·19	4·15	4·42	3·05	0·44	0·94	4·16	0·84	0·47	Nil
Townsville	3·25	1·45	7·74	14·03	12·49	7·75	7·37	1·03	3·11	2·38	Nil	0·07	0·14
South.													
Barcaldine	2·88	2·92	1·33	1·04	3·44	0·43	1·51	0·82	0·34	2·03	0·87	0·06	Nil
Beenleigh	3·47	2·94	1·75	3·98	4·75	3·88	4·17	0·58	4·70	4·92	0·71	0·58	Nil
Biggenden State Farm	5·07	1·19	3·09	4·55	5·77	3·55	10 91	0·34	4·02	5·24	1·51	0·96	0·24
Blackall	4·70	5·86	1·37	1·96	2·30	Nil	2·78	1·69	0·20	0·36	1·36	0·06	Nil
Brisbane	3·48	3·81	1·07	3·28	2·69	5·23	5·32	0·45	4·75	2·91	0·39	0·79	0·10
Bundaberg	10·90	1·57	0·97	3·85	3·29	3·90	12·81	0·38	3·08	4·49	0·87	0·43	Nil
Caboolture	4·77	4·73	4·26	3·15	2·53	8·03	9·04	0·78	3·10	4·98	0·73	0·32	0·13
Charleville	4·99	2·66	1·30	3·71	0·85	Nil	2·75	2·29	0·26	0·90	1·04	0·76	0·02
Dalby	2·65	2·96	2·12	5·67	5·60	1·34	3·72	0·20	2·26	2·35	0·87	0·71	0·15
Emerald	4·47	1·55	2·32	1·79	7·36	3·67	7·66	Nil	Nil	2·53	1·75	0·10	Nil
Esk	4·14	2·90	2·45	5·26	2·87	6·79	3·60	0·22	5·42	2·66	0·54	0·81	0·57
Gatton Agric. College	3·54	2·25	2·01	3·45	2·62	6·44	2·71	Nil	2·80	1·85	0·54	0·56	0·15
Gayndah	5·14	2·25	4·25	2·82	3·00	1·91	6·89	Nil	2·65	3·00	1·21	0·53	0·40
Gindie State Farm ...	4·57	3·20	2·95	1·45	6·13	0·71	10·10	Nil	Nil	2·29	1·58	0·10	0·16
Goondiwindi	3·33	2·36	2·32	4·04	5·37	1·77	6·51	0·33	1·30	1·09	1·62	0·95	0·12
Gympie	3·97	3·03	4·12	5·32	3·99	6·96	8·93	1·12	3·84	3·77	0·80	0·17	0·47
Ipswich	2·94	2·60	0·71	4·22	2·17	5·38	1·95	0·12	3·43	2·22	0·30	0·43	0·05
Laidley	3·19	2·87	1·78	4·12	2·84	4·50	3·47	Nil	2 99	1·56	0·45	0·58	0·15
Maryborough	6·48	1·22	2·49	4·39	5·52	7·84	10·28	1·25	3·21	6·05	0·64	0·93	0·25
Nambour	8·94	4·89	3·40	6·74	5·74	12·05	13·30	1·36	4·54	6·96	1·08	1·13	0·60
Nerang	6·42	8·26	2·75	6·33	9·86	6·04	7·83	1·48	7·[illegible]4	5·08	1·26	1·35	0·05
Roma	4·43	2·37	1·32	4·31	6 32	2·92	1·87	0·42	0·27	2·47	1·03	0·42	0·04
Stanthorpe	4·29	2·90	2·49	4·89	4·33	3·30	5·98	1·68	1·79	2·44	1·06	1·65	0·13
Tambo	5·17	2·85	1·23	1·16	4·74	1·41	3·58	3·69	0·11	0·89	1·42	0·09	Nil
Taroom	4·26	1·70	1·35	5·49	5·16	1·10	1·86	Nil	1·01	3·76	0·70	0·04	0·10
Tewantin	6·37	4·38	2·73	9·53	6·38	15·83	11·45	1·87	7·16	7·61	1·48	0·95	0·55
Texas	2·77	3·42	2·23	1·83	4·69	4·55	6·16	0·65	0·93	1·62	1·31	0·87	0·07
Toowoomba	4·55	2·76	2·65	4·11	3·94	4·00	4·81	0·01	4·61	3·34	0·91	0·65	0·17
Warwick	3·13	2·47	2·99	5·50	3·95	2·52	5·71	0·51	1·58	1·27	1·16	1·37	0·01
Westbrook	3·34	3·41	1·79	1·48	1·79	2·91	5·13	0·02	2·53	2·53	1·04	1·78	Nil

* Compiled from telegraphic reports. † Return not received.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

HATCHING QUESTIONS.

By M. FERN.

Chicks Dead in Shell.

The question is being continually asked,—Why do chickens die in the shell? There are many causes—viz., immature or unhealthy stock birds; in some cases, although the eggs are fertile, the germ is weak and develops up to a certain point, and then dies very often just on the point of hatching. This is noticed to a greater extent in incubators, particularly during a dry spell like the present one we are passing through. The moisture in the egg dries too rapidly, and the chick becomes cramped in the shell, and in some cases just on point of exclusion the skin becomes dried to the shell, with the result that the chick has to be helped out, and as a result generally dies. Moisture should be applied to the eggs in an incubator during this sort of weather, either in trays or by sprinkling with warm water; another plan is to soak a strip of flannel in warm water and place the same over the eggs till all the moisture is drawn out of it.

Other causes for dead chicks are keeping eggs too long or in too high a temperature.

Eggs intended for hatching should be carefully selected, all extra large or too small or malformed or rough eggs should be rejected, and those passing the tests should be kept in as cool a place as possible. If an incubator is to be used, eggs should be started as soon as possible; a week is quite long enough at this time of year. If kept longer than that period, best results cannot be expected. Under hens, they may be hatched after storing for a couple of weeks. Good results can be obtained by placing eggs under a hen for the first week or ten days, and then placing them in a machine for the last term of incubation.

All hatching should be well under way, if not completed, by the end of October. To those who are still busy with their machine, greater care in sticking to the above point will be necessary. It is quite possible to bring off good hatches right through November, particularly in the colder parts of the State.

Brooders.

The brooders must be kept well ventilated to prevent chicks sweating. Care must also be taken to provide safe shelter in case of sudden storms and flooding. Many a brooder full has been lost by placing it where the storm water rushed through it, drowning all the chicks. Very little, if any, applied heat is required now, as the chicks will do well if placed out of draughts. Shelter from the sun must be provided for growing chicks, and drinking water must be kept cool and clean.

MEXICAN EXPORT OF SISAL FIBRE.

During the year 1906 the exports of sisal fibre from the port of Progreso, in Yucatan, to the United States amounted to 97,141 tons, valued at 29,389,138 dollars. The value of the Mexican dollar being 2s. 4d., this represents a value of £35 5s. per ton, or a total value of £3,428,782.

CANE-CUTTING MACHINE.

The "Agricultural News," Barbados, says:—It is reported from Java that an engineer on a sugar estate in the island has invented a machine which will greatly simplify the cutting of canes in the field. By its aid, it is said, two men can cut as much as 18 tons of cane a day, and further experiments are being proceeded with.

ITALIAN LABOURERS.

The "Louisiana Planter," of 15th June last, states that the employment of poor Italian immigrants on cotton plantations in Arkansas has given very satisfactory results. The Italian workmen are described as industrious, thrifty, and generally temperate, and they surpass the negroes, both in the amount and the quality of their work.

ORIGIN OF THE WORD "MERINO."

Merino sheep are named from the adjective term "merino," which the Spanish dictionary gives as a term applied to sheep "moving from pasture to pasture." They are always in the open air, and travel every season from the cool mountains of the northern portions of Spain to feed in winter over the southern and warmer plains of Andalusia, Mancha, and Estramadura. There are supposed to be in Spain about 10,000,000 of this fine-woolled travelling race, tended by about 50,000 shepherds and guarded by 30,000 dogs.

QUEENSLAND HEMP.

The London correspondent of the "Brisbane Courier," writing under date 30th August, says:—"Several requests for information as to the available supplies of Queensland sisal hemp have lately been made at the commercial branch of the Government agency in London. The officer in charge (Mr. H. E. Garraway) states that he received three inquiries on the subject from different German manufacturing centres within one week. Experts who have seen samples of the hemp grown in the St. Helena district speak very favourably of its quality, and Mr. Garraway thinks, as the result of information that he has received from various quarters, that a profitable market could readily be found for large quantities of the Queensland hemp, both in England and on the Continent. There appears to be some scarcity at present in the better qualities obtainable from Mexico, Manila, and India."

[Unfortunately, it has been so difficult to induce farmers in this State to understand how large are the profits to be derived from the sisal industry, that there are only three plantations in the State which will be able to produce fibre within the next twelve months, and all that can be produced for the next five years, at least, will be readily saleable in Australia at from £35 to £36 per ton, without any additional expense for freight.—Ed. "Q.A.J."]

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	OCTOBER. Prices.
Apples, Eating, Local, per packer	...
Apples, Cooking, Local, per packer	...
Apricots, Local, per packer	...
Bananas, Cavendish (scarce), per dozen	2½d. to 2¾d.
Bananas, Local, per bunch	...
Bananas, Sugar per bunch	6d. to 1s. 6d.
Custard Apples, per quarter-case	...
Cape Gooseberries, per quarter-case	4s. to 6s. 6d.
Grapes, per lb.	...
Lemons, Local, per packer	3s. to 4s.
Mandarins, per packer	5s. to 7s. 6d.
Mangoes, per case	...
Nectarines, per quarter-case	...
Oranges, per packer	3s. 6d. to 5s. 6d.
Papaw Apples, per case	...
Passion Fruit, per quarter-case	...
Peaches, per case	...
Peanuts, per lb.	2d. to 2½d.
Pears, Imported, per case	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	1s. to 3s.
Pineapples (smooth leaf), per dozen	1s. to 4s.
Plums, quarter-case	...
Quinces, per case	...
Rockmelons, per dozen	...
Rosellas, per bag	...
,, per quarter-case	...
Strawberries, per tray	...
Tomatoes, per quarter-case	2s. 3d. to 5s. 9d.
Watermelons, per dozen	...
SOUTHERN FRUIT MARKET.	
Apples, Tasmanian, per case	...
,, Other, per bushel case	...
Bananas, Fiji, per case	14s. 6d. to 15s.
,, ,, per bunch	4s. to 7s.
,, Queensland, per bunch	2s. 6d. to 5s. 6d.
,, ,, per case	13s. to 13s. 6d.
Chillies, per bushel	...
Grapes, per box	...
Lemons, Ordinary, per gin case	...
Loquats, per box	...
Mandarins, Queensland, in Melbourne, per case	...
Oranges, Queensland, per case	10s. to 12s.
Oranges, Queensland, in Melbourne, per case	...
Oranges, Navels, Queensland, in Melbourne, per case	...
Pears, Victorian Vicars, per box	...
Persimmons, per half-case	...
Pineapples, per case	5s. to 7s.
Passion Fruit, per case	8s. 6d.
Quinces, per gin case	...
Strawberries, Queensland, per ¾-box	3s. to 4s. 6d.
Tomatoes, Queensland per gin case	5s. to 6s.
,, ,, (green)	...
Watermelons, Queensland per dozen	...

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR OCTOBER.

Article.		OCTOBER. Prices.
Bacon (Pineapple)	lb.	8½d. to 10½d.
Barley (Malting)	...	...
Bran	ton	£5 10s. to £6
Butter, Factory	lb.	11½d.
Chaff, Mixed	cwt.	£5 5s. to £5 10s.
Chaff, Oaten	ton	£5 10s. to £5 15s.
Chaff, Lucerne	"	£4 to £7
Chaff, Wheaten	cwt.	£3 to £3 5s.
Cheese	lb.	7½d. to 9d.
Flour	ton	£11 to £11 10s.
Hay, Oaten	"	£6 10s. to £7
Hay, Lucerne	"	£4 10s. to £6 5s.
Honey	lb.	1¾d. to 2¼d.
Maize	bush.	3s. 7d. to 3s. 10d.
Oats	"	3s. 7d. to 3s. 9d.
Pollard	ton	£5 15s. to £6
Potatoes	"	£3 15s. to £6 10s.
Potatoes (Sweet)	"	...
Pumpkins	"	...
Wheat, Milling	bush.	...
Wheat, Chick	"	4s. 3d. to 4s. 9d.
Onions	ton	£4 15s. to £5
Hams	lb.	1s. 0½d. to 1s. 1d.
Eggs	doz.	7d. to 7½d.
Fowls	pair	2s. 4d. to 3s. 8d.
Geese	"	5s. to 5s. 6d.
Ducks, English	"	3s. 9d. to 4s.
Ducks, Muscovy	"	4s. to 5s. 6d.
Turkeys, Hens	"	5s. 9d. to 7s. 6d.
Turkeys, Gobblers	"	10s. to 17s. 6d.

ENOGGERA SALEYARDS.

Animal.	SEPTEMBER. Prices.
Bullocks	£9 5s. to £12 2s. 6d.
Cows	£8 to £9 12s. 6d.
Merino Wethers	24s. 9d.
C.B. "	26s. 6d.
Merino Ewes	23s.
C.B. "	22s. 3d.
Lambs	17s.
" (Extra)	...
Pigs (Baconers)	34s.
" (Porkers)	26s. 6d.

Orchard Notes for December.

By ALBERT H. BENSON.

In the Orchard Notes for November, I called special attention to the importance of marketing fruit properly, emphasising the necessity for careful handling, even grading, and attractive packing if satisfactory prices are to be obtained. Those remarks apply equally to the present month, or, in fact, to any month of the year, as there is always more or less fruit of one variety or another to be marketed; and it is simply wasting time and money cultivating, pruning, manuring, or spraying an orchard—in fact, doing everything possible to produce good fruit—if when the fruit is grown it is not put to the market in such a manner that it will realise the highest price. Careful handling, grading, packing, and marketing will secure a ready sale for good fruit in any market, even when the same fruit badly handled and unattractively got up would be unsaleable. Growers would do well to take a lesson in packing from the Californians who have been shipping apples, or from the Italians who are shipping lemons, to this State, as those fruits, even after a long and trying voyage and one or more transhipments, reach here in better condition and in a much more attractive state than our local fruit, which is often only carted a few miles.

Keep down pests wherever met with; gather and destroy all fly-infested fruit. Destroy orange bugs before they become mature by hand-picking or by driving them to the trunks of the trees, by tapping the other branches with light poles, the insects being brushed off from the trunks and main branches on to a sheet placed under the tree to catch them, from which they can be easily gathered and burnt.

All caterpillars, cut-worms, beetles, grasshoppers, crickets, or other insects destroying the foliage should be destroyed by either spraying the same with Paris green, 1 oz. to 10 gallons of water, or by dusting them with a mixture of Paris green and air-slacked lime, 1 oz. of Paris green to 5 lb. of lime. Keep the orchard well cultivated, especially in the dry districts; and where there is water available for irrigation in such districts, all citrus trees should receive a watering during the month unless there is a good fall of rain, when it will be, of course, unnecessary.

Pineapples, bananas, and other tropical fruit can be planted during the month, showery weather and dull days being chosen. The rainy season is the best time to transplant most tropical plants. Where it is desirable to go in for green-crop manuring, or for raising the green crop for mulching, cowpeas can be sown, as they will be found to make a very rapid growth now, which will be strong enough to keep most weeds in check.

See that all surface and cut-off drains are in good working order, and not choked up with grass, weeds, &c., as heavy rain may fall during the month, and there should be a get-away for all surplus water, which would tend to either wash the soil or sour it; stagnant water round the roots of the trees being exceedingly injurious at any time, and especially so during the heat of summer.

Farm and Garden Notes for December.

Field.—The grain harvest will now be nearing completion, and, although the results are not likely to constitute a record, it will in all probability turn out to be very satisfactory to the wheat-growers. The principal factor operating against an increased yield is, that many farmers who formerly grew wheat and barley have turned their attention to dairying, which offers larger and quicker returns.

The dry weather which prevailed during the months of August and September gave rise to grave fears for the harvest, but the subsequent timely rainfall came just in time to save the crop. The estimates of the probable yield have varied so considerably that it will be well to wait until the harvest is over before calculating on the result.

Given favourable weather, maize, panicum, imphee, Kafir corn, and sorghum may be sown. Arrowroot, ginger, and sweet potatoes may be sown.

Kitchen Garden.—Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered, otherwise the plants will leave off bearing. Seeds of all these may still be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Take up onions, and spread them out thinly on the barn floor until the tops wither sufficiently to pull off easily. They should then be graded into sizes, and sent to market or stored in a cool place. Where there is an unlimited supply of water, and where shade can be provided, lettuce and other salad plants may still be sown.

Flower Garden.—Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan" or caked surface beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulacca, zinnia, and cockscomb. Plant out whatever amaranthus may be ready. These may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the great part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant them out at once in their new positions. Top-dress all lawns.

Times of Sunrise and Sunset at Brisbane, 1907.

Date.	September.		October.		November.		December.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·4	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·3	5·34	5·28	5·48	4·58	6·6	4·46	6·28
3	6·2	5·34	5·27	5·48	4·57	6·6	4·46	6·29
4	6·0	5·35	5·26	5·49	4·57	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6·8	4·46	6·31
6	5·58	5·36	5·24	5·49	4·55	6·8	4·46	6·31
7	5·57	5·36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·22	5·51	4·54	6·10	4·46	6·33
9	5·55	5·37	5·21	5·51	4·53	6·11	4·46	6·33
10	5·54	5·38	5·20	5·52	4·53	6·11	4·47	6·34
11	5·53	5·38	5·19	5·52	4·52	6·12	4·47	6·35
12	5·52	5·38	5·18	5·53	4·51	6·13	4·47	6·35
13	5·50	5·39	5·16	5·53	4·51	6·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·51	6·14	4·47	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·47	5·40	5·13	5·55	4·50	6·16	4·48	6·38
17	5·46	5·41	5·12	5·55	4·49	6·17	4·48	6·39
18	5·45	5·41	5·11	5·56	4·49	6·18	4·49	6·39
19	5·44	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·48	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·41
23	5·39	5·43	5·6	5·59	4·47	6·22	4·51	6·42
24	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·42
25	5·36	5·44	5·5	6·0	4·47	6·23	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·24	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·25	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·26	4·54	6·44
30	5·31	5·47	5·0	6·4	4·46	6·27	4·55	6·45
31	...	...	5·0	6·4	...	...	4·56	6·45

Phases of the Moon.

			H. M.
8 Sept.	●	New Moon	7 4 a.m.
15 ,,	☾	First Quarter	1 40 p.m.
22 ,,	○	Full Moon	7 34 a.m.
29 ,,	☽	Last Quarter	9 37 p.m.
7 Oct.	●	New Moon	8 21 p.m.
14 ,,	☾	First Quarter	8 2 ,,
21 ,,	○	Full Moon	7 16 ,,
29 ,,	☽	Last Quarter	5 51 ,,
6 Nov.	●	New Moon	8 39 a.m.
13 ,,	☾	First Quarter	3 14 ,,
20 ,,	○	Full Moon	10 4 ,,
28 ,,	☽	Last Quarter	2 21 p.m.
5 Dec.	●	New Moon	8 22 p.m.
12 ,,	☾	First Quarter	0 16 ,,
20 ,,	○	Full Moon	3 55 a.m.
28 ,,	☽	Last Quarter	9 10 ,,

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	Rockhampton.		Townsville.		Cooktown.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
September 1 to 22	9 m.	11 m.	24 m.	30 m.	27 m.	35 m.
,, 23 to 30	10 m.	10 m	28 m.	26 m.	32 m.	30 m.
October	12 m.	8 m.	32 m.	22 m.	38 m.	24 m.
November ...	16 m.	4 m	40 m.	14 m.	50 m.	12 m.
December ...	18 m.	2 m.	44 m.	10 m.	55 m.	7 m.

Agriculture.

QUEENSLAND INDUSTRIES.

No. 2.—MARKET GARDENING.

By A. J. BOYD.

CABBAGES AND CAULIFLOWERS.

Most of our cultivated vegetables and fruits have originated from comparatively worthless beginnings, and there is no more striking example of what can be accomplished by means of cultivation than is presented to us by the lowly cabbage, the handsome califlower, the diminutive Brussels sprout, the gigantic Jersey cabbage, and, in fact, by most of the cultivated plants of the cabbage family. It has, of course, been by a process of evolution for hundreds of years, by hybridisation, by selection, &c., that the fittest have survived and to-day exist in their present useful form. It is supposed that the cultivated cabbage has been grown for at least 3,000 years. The Egyptians grew cauliflowers in the days of the Pharaohs, but the first record we have of this vegetable being sold in London occurs in the year 1619, when the British farm labourer was paid at the rate of 4d. per day. However, my purpose is not to give the history of the Brassica family, but to advise beginners at market gardening how to produce them successfully.

Why do we import large quantities of cauliflowers from the South? Why do even farmers buy cabbages and other vegetables from Chinese gardeners? I suppose it is on the principle that white sheep eat more than black ones—there are more Chinese gardeners than there are of our own race; and one can only assume that our people patronise the Chinamen because they do not know how to properly grow cabbages, &c. If this be so, then it will not come amiss to tell them how to do it.

CABBAGES.

Under certain conditions, cabbages can be grown in most parts of Queensland. They naturally, however, come to the greatest perfection in the colder districts. I have seen very fine cabbages grown in the warm Central districts, where the summer temperature equals that of Bengal. Yet in the latter Presidency the vegetable has been grown in pots as a curious exotic! The conditions which best suit the cabbage are: A rich soil, deep cultivation, and plenty of water, besides thorough after-cultivation. If the soil be not naturally rich, it must be made so by working in quantities of good well-rotted stable and cowyard manure, and the soil fertility can also be still more increased by adding some dried blood manure. The first thing to be done, however, is to prepare a seed-bed, as already explained. Then sow the seed in little drills about 6 inches apart, and cover them by shaking fine rotted manure or fine soil over them. Do not rake them in, or the seed will either be collected in little heaps or they will be covered to too great a depth; seeds should not be deeper in the ground than their own diameter. Give the plants as soon as they appear above ground plenty of water, shading them from the hot sun by means of the canvas screen on the seed-bed, but do not keep them constantly covered, or they will grow up weak and spindly. In about four or five weeks they should be ready for planting out. This operation should, if possible, be done in showery, or, at least, in cloudy weather. If the ground is dry at transplanting time, a little water should be used to prevent the soil falling into the hole made by the dibble. There is a very useful machine made for planting out cabbages, which, I believe, can be bought in Brisbane.

Before taking up the young plants, soak the seed-bed thoroughly, so that the former may be raised with little injury to the roots. If there be any aphis

or grubs on the plants, plunge every part of them except the roots in tobacco water. Trim off about half the leaves, as these would drop off and decay in any case, but before doing so, would act prejudicially by using up the moisture in the ground.

When the plants are taken out of the seed-bed, place them at once in a puddle made of soil and water in the bottom of a bucket, so that when they are carried out on to the field the roots may not be exposed to sun and wind. The handiest implement for planting is a wooden dibble, made out of the handle of an old spade or fork. Some care must be taken in putting in the plant. The hole made by the dibble should only be deep enough for the plant. See that the roots reach the bottom, turn in a little soil, and then draw the plant slightly upwards before pressing the rest of the soil firmly round it. This ensures that the main root will not be doubled up, which would have a bad effect on the maturing plant. Should dry weather continue, constant watering will be necessary, but by the use of mulch the labour of watering will be considerably lessened. A well-grown cabbage will occupy a space of about $2\frac{1}{2}$ feet, therefore give plenty of room. Leave 3 feet between the rows each way for the large varieties, and 2 feet for the smaller ones. To avoid the trouble of hilling up, the plants may be set in the bottom of a shallow furrow. Thus they are to some extent protected from the sun, and will not require hilling up, as the gradual filling up of the furrow during subsequent cultivation will do all that hilling up performs, and do it better.

The great secret of success in cultivating plants of the cabbage family is to *keep them constantly growing*, and never allow them to be checked by any cause whatever. Keep them on the move by constant cultivation and plenty of water. About twice a week give them a watering of liquid manure, which will help greatly to promote rapid growth. Insect pests are most troublesome when plants are checked in their growth from some cause or other.

If cabbage plants take too long to mature, the heads, instead of being tender and succulent, become tough and leathery. Good tender cabbages should only take three, or at most four, months to be ready for the table. To ensure success, keep the ground clean, and conserve the moisture by constant cultivation. Do not wait till you see weeds to cultivate, but do it after every shower of rain, until the plants get too large to allow of implements being used among them. In the cooler parts of the country cabbages may be grown all the year round, but in the warmer districts it is hardly worth while growing them in the summer months, as there are so many insect and other pests to contend with that a great deal of the profit is lost in keeping the plants clean.

In the warmer districts, the first sowing may be made in January or February, and then, at intervals of a month or so, up to August or September. For summer crops, St. John's Day and Early Jersey Wakefield are about the best, as they are early sorts, and mature very quickly; in winter, the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, are most profitable.

CAULIFLOWERS.

Cauliflowers thrive during our coldest months, and should therefore be planted out in time to ensure their flowering in that season. The best time for sowing the seed is between the middle of January and the middle of March, as cauliflowers occupy the ground from five to six months, and should be in flower in the coldest weather. The best kind to sow is Eclipse or other large Asiatic variety, Early Dwarf, and Le Normand. If any is sown after April, it must be a very early variety which will mature before the weather gets too hot. The seed is sown in the same way as cabbage seed, and the planting out is also done in the same way, but much more care is required in transplanting than in the case of cabbage. The soil must be of the richest, and cauliflowers do better in virgin soil than elsewhere, provided the ground is thoroughly dug over to a depth of 15 inches, and well pulverised. Cultivation should be thorough and

fairly deep until the plants begin to head, or until the leaves spread so much that they are liable to be broken by the cultivating implements. As soon as the heads begin to form, cultivation may cease, because, if still carried on, there is a tendency for the heads to grow loose and coarse, instead of firm and compact. At this stage water is more essential than ever, and a good watering with liquid manure twice a week will add greatly to the bulk and quality of the crop.

It should always be borne in mind that the market value of cauliflowers depends entirely on their being of fair size, and *white* and tender. To secure the whiteness of the flower, as soon as the heads begin to form the leaves ought to be drawn together at the top and tied or skewered over the heads. This will protect them from the sun and cause them to be properly blanched. There is quite a knack about tying them up. If the cauliflower is tied up too soon or too close its growth is stunted; again, if not tied up close enough the heads get discoloured. The proper way is to gather up just enough leaves to shade the head perfectly, and tie these as low down as possible, just so low that the string is a trifle above the head, thus allowing the tops of the leaves to spread out somewhat to the air, and not retard the growth of the plant.

Care must be taken to destroy the grubs, which eat into the heart of the plant, and especially should the great Vaginula slug be watched for. A ring of tobacco dust or waste tobacco stems round the plants, or even round the whole bed, will effectually prevent the attacks of this night marauder.

When cutting the matured plants, the work should be done early in the morning while the dew is on them, as they keep fresher for a longer period than if left till the sun gets hot.

The following indications will show when a head is ready to cut:—

The leaves bulge out considerably at the base, and the head begins to lose the polished, smooth appearance which has hitherto characterised it, and becomes grained and somewhat irregular. To examine the head it is not necessary to untie the top leaves, but part them at the side, so that, if not quite ready, cutting may be deferred until the next day. Cut with 2 or 3 inches of the stalk and two or three circles of leaves.

Handle very carefully, and take care not to bruise the heads in any way, as even a slight bruise soon becomes black, and this detracts greatly from the market value. It is said that cauliflowers may be preserved for some time after the crops are over by attention to the following directions:—

Pull the plants up by the roots a day or two before they are ready for cutting. Tie the tops of the leaves loosely together; then place them in a cool shed; cover the roots with damp sand or sandy soil, and the heads will keep quite fresh for several weeks.

INSECT PESTS.

Both cabbage and cauliflower are subject to the attacks of insect pests, which either eat the heart of young plants right out or riddle the leaves, and render them unsightly. Paris green sprayed on the plants immediately the larvæ are discovered will destroy them. Aphides are a great source of trouble, and should be promptly dealt with. Weak kerosene emulsion or tobacco water will destroy aphides easily. It should be borne in mind that Paris green, being an arsenical poison, must not be used on crops of this kind within five or six weeks of their being ready for market.

Weight of cabbage seed required per acre, 2 lb. Manures for cabbages, per acre, 12½ tons stable manure, with 6 cwt. superphosphate and 6 cwt. of nitrate of soda, used as a top-dressing; one-half the nitrate being applied at the time of planting, and the remainder about a month or two later. If farmyard manure cannot be obtained, increase the nitrate of soda to 8 cwt. per acre. For Savoy cabbages, with farmyard manure, 4 cwt. nitrate of soda, and without it 6 cwt.

For cauliflowers, 12½ tons of farmyard manure, 4 to 6 cwt. of superphosphate, 4 cwt. of kainit, and 4 cwt. of nitrate of soda, the latter applied in two

dressings. Without dung, a good crop may be grown by using 6 cwt. superphosphate, 4 cwt. of kainit, and 6 cwt. of nitrate of soda (in two or three dressings).

BRUSSELS SPROUTS.

Brussels sprouts can be well and economically grown in the cool portions of the State, on the rich, deep, black loam, which is particularly adapted to all the Brassica family. If the seeds are sown in June or August, and again in November and February, given a fair season and suitable conditions of soil and cultivation, success is certain. The cultivation is the same as for cabbages, but. owing to their height, they require more room. The proper distance for transplanting is 3 feet between the rows and the plants 2 feet apart. The plant rises with a very long stem, which has a spreading head at the top. In order to facilitate the formation of the sprouts (which are really only diminutive cabbages), the large leaves should be broken down at all the joints in the stem. The sprouts will then form in a thick cluster round the stem from the root to the top. They should be gathered when they look like half-open rosebuds, and it is advisable, when removing the first crop of sprouts, to do so with a sharp knife, so as to avoid making a large wound, which would be the case if they were plucked off.

If any manure is required, farmyard manure may be dispensed with, and its place be taken by the artificials recommended for cauliflowers.

PEAS.

There are two distinct forms of peas now in general cultivation—namely, round and wrinkled. These again may be either dwarf, medium, or tall. The wrinkled varieties are usually the earliest to come into bearing, and are also generally the most productive. They remain, as a rule, longer in bearing than the smooth or round kinds.

Peas may be grown in many different kinds of soil, but perhaps the best is a rich, light, sandy loam. If manure is used, it should be well decomposed and thoroughly worked into the soil.

The time for sowing here is from January to September, sowing enough once a fortnight to keep up a constant succession. The dwarf varieties should be sown in rows not less than 3 feet apart, and the tall-growing kinds about 5 feet. A good plan is to plant the rows of tall peas 8 or 9 feet apart, and grow two or three rows of cabbages or other vegetables between them. By this plan the sunshine and air will have free access to all the peas, which would not be the case if they were so close as to overshadow each other. Peas should not be sown too thickly. Make drills about 2 inches deep, and drop the seed at intervals of 4 inches. To economise ground, peas may be sown in double rows, 6 inches apart, and the seeds at intervals of 6 inches. A good crop can thus be obtained from a small area.

The tall varieties must be supported on brushwood, sticks, or for preference on wire trellises, fixing the netting about 10 inches above the ground. Frequent cultivation is necessary during dry weather, and liberal watering. Liquid manure also may be applied with advantage. The best varieties to grow are:—McLean's Little Gem, Stratagem, Yorkshire Hero, American Wonder, Pride of the Market, and Sir Henry Atkinson, none of which are tall-growing, and hence do not require supporting.

BEANS.

There is a considerable variety of beans for gardening purposes. These comprise French or kidney beans, including the stringless Butter Beans, Pole Beans, Scarlet Runners, Broad Beans, and Lima Beans. All these are annuals except lima beans, which are perennials in districts where there is no severe winter cold. French beans may be grown all the year round in many parts of Queensland, but where frosts prevail the season may be reckoned from the middle or end of August until April or May. During these months, successive sowings may be made at intervals of two or three weeks when the ground is not

too dry. Any good garden soil will grow French beans, but the best crops are obtained from good loams or alluvial soils. The drills should be a few inches deep, varying from 2 to 4 inches, according to the weather and the state of the soil. Make the rows 3 feet apart, and put the seeds at least 6 inches apart in the rows.

Should the soil be very dry, water it well before sowing. The beans should be gathered as they become fit—that is, while young and tender; and unless it is desired to save some for seed they should not be allowed to ripen, as thereby the bearing powers of the plants will be considerably lessened.

Pole or runner beans are summer plants, and may be sown from September to February or March. The rows for these should be 4 or 5 feet apart, and, before planting, poles about 6 feet long should be set up along the rows at a distance of 3 or 4 feet apart. Around each pole plant 6 or 8 seeds, 2 inches deep, and when they come up thin them out, leaving four of the strongest plants to each pole. It may sometimes become necessary to tie the young tendrils to the poles at first, but as soon as they begin to run they will twine around the sticks naturally without any artificial help. Broad beans do not succeed well in the hot weather, their season being from March to September. Sow in drills 3 or 4 feet apart, 3 inches or so deep, and the beans about 9 inches apart in the rows. When the plants come into flower, their tops should be pinched off in order to check the upward growth and cause the beans to set. If this pinching is neglected, in all probability the plants will continue to grow, most of the flowers will drop off, and there will be little or no crop. The beans should be gathered as they become fit whether they are wanted or not, so as to prolong the bearing season as much as possible.

Lima beans are a good crop to grow in the summer months, as they will stand any amount ow heat and dry weather, and continue in bearing for a very long time. The dwarf or bush limas are perhaps the best to grow, as they require no poles, and consequently give less trouble. Lima beans may be planted in August or September, and again in November, and will continue to grow and bear until cut down by the frosts of winter. Dwarf limas may be planted in drills 3 feet apart and the seeds 18 inches apart in the rows, or in hills of four or five seeds 3 feet apart each way. The seeds should not be planted more than 2 inches deep, and should be placed in the ground edgeways, with the eyes down.

The pole limas require the same treatment precisely as other pole beans. French beans and most of the pole beans are *pod* beans, of which the edible part is the young and tender seed pod. Broad and lima beans, on the other hand, are *shell* beans, the part used for food being the bean itself and not the pod.

All of these, except the lima, must be used when young and tender. The lima beans may be used green (the bean itself, not the pod) or allowed to ripen, and stored for winter use. They will keep for a long time, and only require soaking in water before cooking to render them soft and palatable. They are the most delicious of the pod beans. Lima beans should be more extensively cultivated than they are, because they will succeed in dry seasons when other beans fail, and continue to bear right through the summer.

The varieties of French beans, including butter beans, are very numerous, and each grower must choose what best suits his requirements.

Of the limas, the largest and most delicately flavoured are Burpee's bush lima.

A good manure for beans is a light dressing of farmyard manure, 4 to 6 cwt. of superphosphate, and 1 cwt. of sulphate of potash (or 4 cwt. of kainit) per acre. The use of 2 cwt. of nitrate of soda per acre gives a very substantial increase of crop. An acre so treated has given an increase of nearly 50 per cent. Where 3¼ tons of French beans were obtained from an acre on which no nitrate of soda was used, 4½ tons were gathered on the same area as the result of its use.

[TO BE CONTINUED.]

FLAX-GROWING.

Although flax-growing has not yet been taken up seriously by farmers in Queensland, yet experiments with this plant have been highly successful on the Darling Downs, samples grown at Pittsworth having been very favourably reported on. The straw suffered, however, from the disadvantage of having become too ripe, in which state the fibre deteriorates. The sample was valued by Messrs. Geo. Kinnear and Co., Melbourne, at £4 per ton for the straw, in Melbourne.

At the summer show of the Queensland National Agricultural and Industrial Association, held so far back as in January, 1895, there was a display of flax made from a crop raised from linseed imported from Ireland, and, in order to ascertain its commercial value, the sample was sent to Mr. M. H. Black, who placed it in the hands of prominent Dundee merchants. Messrs. Don Brothers, Buist, and Co., Dundee, reported on it as follows:—

"The quantity of flax sent us was not sufficient for spinning or weaving purposes, but we were able to hackle it, and the result, 88·79 lb. per cwt., appeared satisfactory. On examining the dressed line, however, we were much disappointed. It is dry and weak, and the high yield can only be accounted for by the hackles having failed to split up the fibre. For our own purpose, as spinners of fine yarns, the flax is unsuitable, while its want of strength renders it useless for sailcloth yarns. Brittleness is the characteristic of flax grown in most warm countries, or where the seed is allowed to mature on the plant before being pulled, and it is quite possible that, in the steeping process, it may to some extent have met with injury. From its appearance, however, we fear that under no circumstances would it be a fibre suitable for any ordinary purpose in the linen trade, and that it is altogether more adapted for roping purposes, and this, of course, makes its market value much lower. It is difficult to assess the value of a small sample, which is insufficient for any practical test, but as an indication we would say about £18 to £22 per ton."

This was, we believe, the earliest effort made by the Queensland Department of Agriculture to encourage the flax industry. Since then more practical experience has been brought to bear on the production of flax straw, and, as we have said, the reports on the latest samples submitted to experts have been distinctly favourable. Flax grown on the Darling Downs is produced under climatic conditions similar to those of European flax-growing countries, and hence the brittleness alluded to in the above report does not occur. A second report from the Chamber of Commerce was very satisfactory. This later report said that the flax had been examined by many spinners, and had attracted much attention. The colour and length of fibre were favourably commented on, and dealers inquired whether it could be supplied in quantity, and at what price. A suggestion was made that a trial shipment of 5 tons should be sent to England and placed prominently before the trade, in order that the highest value might be ascertained.

In February, 1907, the Department sent a sample of flax straw, grown at Pittsworth, Darling Downs, to Messrs. Geo. Kinnear and Co., Melbourne. In this case, also, the report was that the straw was too ripe, and it was only valued at £4 per ton. Other samples, grown without reference to seed, and pulled before becoming too ripe, answered all requirements as to quality of the fibre.

As will be shown further on, the straw after pulling is dew-retted, but a new chemical process has been invented by Messrs. Lamb and Murphy, by which retting is rendered unnecessary, and by which the operation, which takes seven weeks by the ordinary method, can be accomplished in one hour. The method at present is a trade secret. Should it prove commercially payable, flax may successfully be produced in those portions of the State where no running or sufficient stationary water is obtainable.

Growing Flax.

The first thing to consider next to climate is the soil. Land suitable for oats, maize, potatoes, or lucerne will produce good flax; but still the land must not be too rich, or the crop may be damaged by lodging. A good sandy loam is a very suitable soil. It must be thoroughly prepared by deeply ploughing, and the surface must be reduced to a fine tilth. The seed requires to be kept close to the surface, at most 1 inch below it, and may be either drilled in or broadcasted. If the latter plan be adopted, and the land is sown for fibre only, about 1 bushel (56 lb.) of seed will be needed. If drilled, half that quantity will suffice. When seed is the object, 28 lb. per acre will suffice.

Flax seed should be sown about the same time as wheat and barley—that is, from April to June. As frosts are beneficent rather than injurious to the plant, it is recommended to sow always in the autumn, so that the young plants may be thoroughly established, but yet not too far advanced, before the winter sets in. The earliest sown fields will mature in about six months; those sown in June will come to maturity earlier. According to the experience of Messrs. Wollf Brothers, of Traralgon, Victoria, the best seed is the Riga. It gives a greater quantity of fibre and seed per acre than the White Belgian, and if got in early there is no fear of the boll worm attacking the seed pods. Fine fibre must always be grown at the expense of the seed yield, while not necessarily increasing the weight of fibre obtained; only the quality would be better.

Harvesting.

The real work of a flax crop begins with the harvesting. If plenty of labour is available, pulling the crop is more profitable than cutting with the reaper and binder. A good crop of flax could be pulled and stooked for 25s. per acre, but under the new laws regulating the wages of farm labourers pulling is not to be thought of. By cutting, at least 3 inches of fibre are lost with each plant, equal to 15s. per acre; but the saving of this would not to-day compensate for the increased cost of the new method of harvesting. In using the reaper and binder, the knives must be as sharp as razors. The sheaves must be as small as the binder will tie to facilitate threshing, and should be stooked in long rows to dry. The drying will take about three weeks, after which the sheaves may be stacked in the same manner as wheat until the time for threshing arrives.

Threshing.

In threshing, a point to be carefully noted is that the straw is not unnecessarily torn about. To avoid this, only the heads of the plants are submitted to the operation. The machine used by Messrs. Wollf Brothers is very simple. It consists of two wooden rollers, each 2 feet in diameter, set one above the other, on spindles. The spindle of the upper one works in slot holes, with a perpendicular play of about 2 inches; and to the spindle of the lower one is attached a wooden pulley, on which is placed a belt from the 5-h.p. oil engine which drives the "breaker" and "scutcher." It is driven at the rate of 140 revolutions a minute. One man feeds the sheaves in without untying them, and another takes them away. Two men can thresh out about 2 or 3 acres per day, at 6d. per bushel for threshing and 2d. per bushel for cleaning.

Extracting the Fibre.

Water-retting.—After the seed is threshed out, the straw has to be retted. This may be done in two ways—water-retting and dew-retting. The difference is that by the first method the sheaves are put into waterholes and left for ten days to ret, when they are taken out and spread in the usual way to dry and bleach. For many reasons this plan has been abandoned in favour of a second method, known as

Dew-retting.—This is very simple, easy, and interesting work. The bundles are untied, and spread out thinly and evenly in long rows on the grass. An acre of grass land will suffice for 2 acres of crop. If there are good rains

and dews, the straw is ready for turning in a fortnight, sometimes three weeks. The swathes are turned over with a long pole, and are then left for another fortnight or three weeks. We have observed in Germany that a pathway is left between the swathes, to allow of watering the straw in dry weather without treading on it, and also to allow room to completely turn over the swathes without piling one lot on top of another. When properly retted, the straw is gathered up loose in thin round stooks to dry for two or three days, then tied into handy bundles with the binder strings, which are saved for the purpose, and carted and restacked close to the shed where the flax is manufactured. Tying, carting, and stacking should be done in the afternoon when the dew is off and the weather dry, and when it is again in the stack it must be kept dry till finally dealt with.

BREAKING AND SCUTCHING.

These are the two next processes. The breaker consists of four fluted iron rollers, in two sets, which turn half round and back. The straw is passed through between these sets, and they break out the woody material in the stems and leave the fibre with a lot of these woody particles adhering to it; and the scutcher, which is simply a set of wooden blades revolving rapidly past an iron shield, cleans these off and leaves the fibre ready for market. The breaker costs £35, and the scutcher £40.

The fibre is put up in 14-lb. bundles, and packed in wool bales holding about 5 cwt.

YIELD.

The average yield of fibre is from 4 to 5 cwt. per acre, and for the best quality the price generally runs to £40 per ton. The yield of seed is about 14 bushels per acre, worth 7s. 6d. per bushel.

CABBAGE APHIS.

The "Journal of Agriculture of Western Australia" says:—Mr. Newman, the Assistant Entomologist, reports that cabbage aphis is very scarce in the Perth districts, and is hard to find. This is put down to the fact that the parasites introduced have done much good work. In the August issue, we published a letter from Mr. Maywood, of Fremantle, in which he states that his garden has been completely cleared of aphis by the introduction of the parasite, and the following paragraph is taken from the "Kalgoorlie Miner" of the 8th October:—"A local amateur gardener, whose information may be relied upon, writes as follows:—'A few weeks ago, I wrote to the Department of Agriculture, asking about the aphis parasite, which I was told could be obtained there. I received an answer enclosing the insects in a glass tube. A minute fly on arrival, in less than a week they were full grown and increasing rapidly. I liberated the valuable little creatures in one of my rose bushes. Roses, stocks, sunflowers, pansies, &c., were covered with aphis vermin, and were suffering severely. In less than a week, the aphides were completely cleared, and the parasites then passed off to my neighbours, with the same result. . . The full-grown parasite is slightly longer and a little thinner than an ordinary house fly, brown, with a few spots on the wings and hind legs. It is very active, and sets about its work in a business way. They seem to have come to stay, for the adjacent gardens are now swarming with them. The Agricultural Department has conferred a boon on the owners of gardens.'"

On referring the above to Mr. Hy. Tryon, Entomologist, that gentleman kindly writes as follows:—

The particular cabbage aphis parasite referred to in the journal, Department of Agriculture of Western Australia, for October, 1907 (Vol. XV., No. 10, p. 732), is unknown to me, but I am of opinion that it will prove to be identical with the *Aphidius brassicæ*, Marshall, a small hymenopterous insect belonging to the Fam. *Braconidæ*.

This is already of common occurrence in Queensland, but here it exerts no great influence in repressing the injurious insect referred to, for which circumstance two explanations may be alleged—(1) The inherent rate of increase of the parasite falls far short of that of the aphis; (2) the aphidius itself is victimised by an hyper-parasite—a further example of the hymenopterous order, to which it belongs.

The fact of the aphides disappearing, subsequent to examples of the aphide parasite being liberated amongst them, is not necessarily an illustration of cause and effect.

Fortunately, cabbage and other aphides are wont to disappear after they have undergone a certain numerical development, a feature that is manifested whether the aphidius be present or not.

This is due to a parasitic disease, which is far more patent in repressing this class of pest than could be any insect parasite, and which probably exists in Western Australia as it does here and elsewhere also.

SHEEP FED ON ENSILAGE.

A Victorian paper says that, at Eunonyhareenyha, near Wagga, a station owned by the Australian Mortgage Land and Finance Company, 19,000 sheep and 400 head of cattle have been fed almost exclusively on ensilage during the past three months. This experience with silage probably constitutes a record for Australia, if not for the world. During the past four good seasons, reserves have gradually been accumulated, until, when the drought set in at the end of last summer, 3,000 tons were available. The silage was made chiefly from the mixture of barley grass and lucerne, which forms the first growth each season on the irrigated paddocks. Various methods were adopted for preserving the silage—a 500-ton silo, built on the plan introduced by Dr. Cherry, and filled with the above materials, after being passed through a chaffcutter; pits were scooped out of a sandhill, and stacks built with and without additional weighing. The results of the feeding have been very satisfactory. Not only has this station maintained all its own live stock through the drought, but 5,000 sheep from another property, belonging to the same company, have been drafted to Eunonyhareenyha. The condition of the stock has been well maintained, and lambing is progressing with satisfactory results. The average cost of making the silage was 5s. per ton, and, allowing a similar amount for the cost of feeding it to the sheep, the total expense works out at 6d. per month per sheep. Had the silage not been available, it would have been necessary to truck nearly all the stock at least 200 miles to get out of the drought area. Dr. Cherry is satisfied that another year considerable improvement may be made in the quality of the silage. So far, the sheep have not been so enthusiastic about eating it as the cattle are, but the success attending this year's work shows the possibility of future development along similar lines.

GROWING CUCUMBERS.

Cucumbers require a rich warm soil, and should only be planted when the soil has been well heated Make the hills 4 feet apart each way.

Plant plenty of seeds in each hill, and, if more than four come up, the extra ones may be taken up and planted out elsewhere after the second leaves appear. Plant quite deep in the ground, water well, and cover the young plants with paper for the first day or two to keep them from wilting.

The best way to irrigate the plants as soon as they show signs of running is to dig a hole large enough to hold a quart can, as near the roots as possible. Make holes in the bottoms of the cans, and place them in the holes near the roots of the plants. Put the cans in the ground about 2 inches deep, and fill them with water every other day.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 31ST OCTOBER, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Rhoda ...	Grade-Shorthorn	12 Mar., 1907	494	5·0	27·66	
Honeycomb	Shorthorn ...	23 Aug. ,,	584	3·8	24·85	
Dot ...	,, ...	23 Aug. ,,	571	3·9	24·94	
Sue ...	Grade-Shorthorn	22 April ,,	502	4·2	23·61	
Dora ...	Shorthorn ...	9 Sept. ,,	560	3·7	23·20	
Chocolate ...	,, ...	5 Mar. ,,	545	3·6	21·97	
Hettie ...	Ayrshire-Sh'th'rn	29 Mar. ,,	466	4·4	22·96	
No. 112 ...	Grade-Jersey ...	23 Aug. ,,	675	2·9	21·92	
Dripping ...	Holstein-Sh'rth'rn	25 Nov., 1906	490	3·9	21·40	
College Lass	Ayrshire ...	14 Sept., 1907	530	3·6	21·36	
Princess ...	Shorthorn ...	13 Aug. ,,	452	4·2	21·26	
Poppie ...	Guernsey-Jersey	24 Feb. ,,	450	4·2	21·16	
Whitefoot ...	Holstein-Sh'rth'rn	28 Sept. ,,	534	3·6	21·53	
Bliss ...	Jersey	17 Sept. ,,	447	4·2	21·02	
Night ...	Holstein-Devon	28 May ,,	541	3·4	20·60	
Butter ...	Shorthorn ...	22 Aug. ,,	506	3·6	20·40	
Pee-wee ...	Holstein-Sh'rth'rn	6 April ,,	505	3·6	20·36	
Rosalie ...	Ayrshire ...	17 Aug. ,,	497	3·6	20·03	
Gem ...	Shorthorn ...	29 Aug. ,,	554	3·3	20·47	
Kit ...	,, ...	12 May ,,	480	3·8	20·42	
Lass ...	Ayrshire ...	19 April ,,	492	3·8	20·93	
Lady Ring ...	Guernsey ...	29 July ,,	341	5·2	19·85	
Ethel ...	Grade-Holstein...	22 Aug. ,,	425	3·8	18·08	First calf
Beatrice ...	Jersey	6 Sept. ,,	457	3·9	19·96	
Clare ...	,, ...	21 Aug. ,,	469	3·7	19·43	

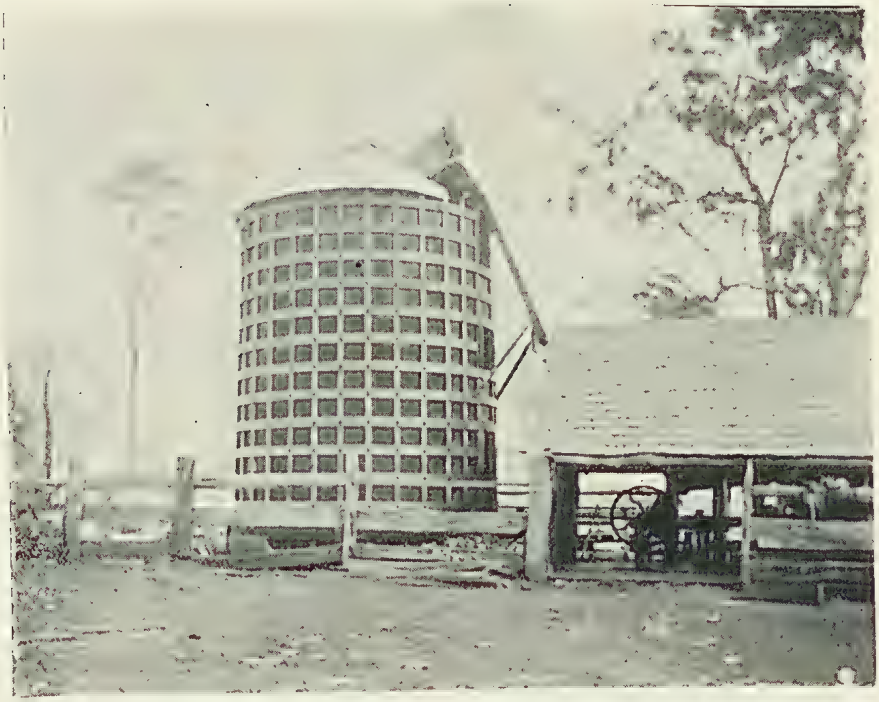
The animals were fed on about 30 lb. of green oats, and depastured on old cultivation fields.

A USEFUL SILO.

The accompanying illustration of a cheap but effective silo will convey a good idea of the structure erected by Mr. J. D. Bond on his dairy farm, Belli Park, Eumundi, Blackall Range. Mr. Geo. G. Bond, who sends us the photo., supplies the following particulars concerning the silo: —

"The silo (which was built from the plans and specifications published in the 'Victorian Journal of Agriculture') has proved to be in every way successful. Its capacity is 60 tons, and it was filled in January and April last with maize, sorghum, and a small quantity of cowpea. Feeding was begun at the beginning of May, and the last of the silage was used at the middle of August. You will understand that we are thoroughly convinced of the value of ensilage as a winter fodder for milking cows when I tell you that the cream cheque for July, 1907 (when my brother was milking twenty-two cows) was *just double* that for July, 1906 (when he was milking thirty-six cows), the difference being due solely to the ensilage, as other conditions were almost similar. The silo cost close upon £35, but, after the experience gained, another could be put up for much less. Filling is done by means of a chain and slat elevator and a No. 11 Ohio ensilage cutter, both operated by a 2-b.h.p. Hornsby oil engine. The iron

Plate XXVIII.



Mr. J. D. Bond's Silo at Belli Park, Eumundi, Blackall Range.

lining was found to be fairly well protected from the acids formed in the silage by two coats of carbon elastic paint and a coating of thick limewash, but it is not certain that those materials would prove effective if the silo were full for a long period—say, twelve or eighteen months. Every farmer who can grow good crops of maize and sorghum should not hesitate to put up one of these silos."

[We agree with Mr. Bond in the latter remark. The farmer who can afford to put up a silo, and will not do so, has only himself to blame for the shrinkage of his monthly cream cheque in such a season as we were lately experiencing.—Ed. "Q. A. J."]

SCOURS IN CALVES.

By J. MAHON, Principal of the Queensland Agricultural College.

The cause of this disease may be traced to a variety of sources, such as dirty buckets, dirty feeding troughs, bad housing, and irregular feeding. Milk is of such a sensitive nature that it absorbs impure bacteria from any source where the impure germs may be located. We cannot, therefore, be too careful in handling the milk used for calf-feeding. The troughs or vessels from which the calves are fed should be daily scalded and rinsed with a little limewater. At the College we have a pen for each calf, and they can, therefore, get their own share of the milk; whereas, if all feed from the same trough, the quick drinkers would get more than their share, and sickness would be the result. Our feeding is done from enamel basins, which are washed every day and rinsed with limewater. A great deal of sickness amongst calves is brought about from the effects of the animals sucking each other; this means that a quantity of hair to a more or less degree is consumed. This habit will not be found where the calves are fed separately.

Treatment.—Add ½ oz. of formalin to 1 pint of distilled water; place the solution in a dark or amber coloured bottle, and keep in a cool place. A tablespoonful of this mixture should be added to each pint of milk to be fed. Adhere to this treatment until the calf recovers. The formalin solution should be added to the separated milk as soon after separation as convenient.

Second Recipe.—Carbolic acid, 10 to 30 drops; tincture of opium, 30 drops; gentian, 30 drops; aromatic spirits of ammonia, 30 drops. Give in half a pint of warm water or milk. Repeat the dose once daily until the calf has recovered.

I have been feeding the calves here for the past three years on separated milk, adding from 2 to 3 lb. of pollard for each calf, quantity according to the age of the animal; the pollard is cooked and mixed with the milk. Maizemeal also should produce good results. For the first week the calf is fed on whole milk; this is gradually reduced to equal proportions of whole and separated milk; and when the calf is from three to four weeks old, pollard and separated milk. The calves should have access to green feed or steamed lucerne or oaten chaff. Irregular feeding will cause unsatisfactory results. I would strongly recommend pasteurising the milk before feeding.

ANGORA MOHAIR.

The mohair of Asia Minor is known and prized the world over for its soft and silky texture. The best qualities come from the provinces of Angora, Kastamuni, and Konia. The number of goats in Asia Minor, from Smyrna to the Persian borders and from Arabia to the Black Sea, is roughly estimated at 3,000,000. No exact statistics are to be obtained as to the quantity exported

last year, but the value is generally estimated at £750,000. With the exception of small quantities brought to Smyrna, the mohair which finds its way abroad is usually sent to Constantinople, and thence, through the medium of English merchants and English ships, to England. English merchants have always, more or less, been able to keep a firm hand on the mohair market. In so doing they have been able to inflict damage on the industry in Turkey, for, in spite of all the efforts of the Turkish Government to prevent it, the Angora goat was smuggled out of the country and successfully reared on the veldts of Cape Colony and Natal. In spite of the application of the most severe prohibitive measure, the Turkish authorities were powerless to do anything in the face of such exorbitant prices as were paid to the peasants for their flocks. According to the American Consul at Smyrna, more serious attention is now being paid to improved methods of rearing the Angora goat in Asia Minor. The Turkish Government has been giving assistance of late in establishing model stations for the improvement of the breed on a scientific and rational basis, as it is claimed that Angora wool, in softness, length, and durability, is superior to that produced in South Africa. There is a movement on foot at present in Asia Minor to start factories in the wool-growing districts, in order that the old primitive methods of utilisation may be superseded. This will be done with a twofold object in view—namely, the creation of means of employment for the people of those districts, and an outlet for the product at home, which will render the industry, on the whole, less dependent upon the foreign demand.—"Indian Trade Journal."

TEACHING A CALF TO DRINK.

There is generally some difficulty experienced in teaching a calf to drink. The "Farmer and Stockbreeder" suggests trying the following interesting but not very convincing American method:—

Fix things so the calf can never suck its dam, and when the cow has mothered it for a few hours milk about 3 quarts of her milk into a pail; put it up under the calf's nose so as to touch it, and in a minute it will drink from the word "Go," and you have won out, and kept your piety besides. A calf that has never sucked will drink as readily as it will get the hang of finding its own dinner.

By the same rule, a heifer should always be hand-milked, and then she knows no other way. Let the calf run with her a few days, and then to milk her is, in her way of thinking, "robbery" of her calf, and you have to break her, which often is quite a vaudeville show, and often of somewhat unpleasant memory. From the start, play that you are the heifer's calf, and make her believe it, and to the calf be its god of the feed dish, and two disagreeable things in dairying—breaking heifers and teaching calves to drink—are made into pleasant pastimes.

MILKING UP TO DATE.

Several installations of the system known as the "Hartnett" patents, which is a Victorian invention, have been started in this State and successfully running for some five months past. Last month we visited Mr. F. Stimpson's dairy, situated at Fairfield, and there saw the apparatus at work, and were greatly impressed by its efficiency and simplicity. The cows appeared to be absolutely indifferent to this method of milk extraction, and the fact that in 1 hour and 20 minutes 45 cows were milked is a striking proof of the work the machines are capable of.

Plate XXIX.

THE "HARTNETT" MILKING MACHINE AT WORK.

The plant consists of four single machines, each cow being milked into a separate can, and the striking feature was the automatic releasers, by means of which the teat cups dropped off and swing clear of the cows as soon as the milk ceased to flow, thus enabling the operator to work and attend to double the number of cows and machines than would be possible by machines where the action had to be turned off and the cups pulled. This ingenious device also absolutely prevents the possibility of injury to the cow by drawing of blood, which has always been the dread with mechanical milking. When the cups had done their work, the dairy hands stripped the cows by hand, but very little milk was left behind.

The pulsator is another good point with this machine, and is worked overhead by a small rod driven by eccentric sheaves off the main pulsator shaft (in some instances, so we are informed, this is effected by means of a bell crank from one end of the shed). The advantage of this lies in the impossibility of damage should a cow kick or roam in the bail. Then, again, the motion being a positive and not intermittent, each pulsation is distinctly regular as the tick of a clock. The working parts of the pulsator are confined to small leather buckets, similar to those used in an ordinary pump, which cannot get out of order.

Peculiar to the "Hartnett" invention is the system of maintaining two vacuums—one operating through the pulsator for working the cups; and the other, which is much lower, holds the cups to the cows, and carries the milk into the can immediately the rubbers squeeze it from the teats. The action of the teat cup, which is operated by the pulsator, is most natural, imitating the action of the calf's mouth. The vacuum pump is of the double-action type, and the whole plant is driven by a 4-brake Campbell oil engine, which was running very smoothly.

Although new to this State, the "Hartnett" machine has grown rapidly into favour in the adjoining States and New Zealand, many hundreds being in use, while in Queensland plants have been supplied to Mr. G. F. Pegg, Beaudesert road; Mr. F. H. Cooper, Greenmount; Messrs. Grindles, Limited, Rocklea; Messrs. Smith Bros., Kilcoy; and several others.

Clark and Fauset, engineers, Eagle street, Brisbane, are the Queensland agents, from whom all particulars can be obtained, and anyone interested visiting Brisbane can, by applying to the agents, see any of the three plants at work within a radius of 5 miles of the city.

HAY CROPPING EXPERIMENTS.

The following interesting results from the grass experiments carried on by an English farmer under scientific advice, recorded in the "Live Stock Journal," may prove of value to those Queensland farmers whose land is not naturally rich, and therefore requires manuring to produce good hay crops. In these experiments the kind of manure used varied with the nature of the soil. Phosphatic manure alone, superphosphate in one field and basic slag in the other (owing to differences in the soil), gave an average of nearly 40 cwt. per acre, and nitrate of soda alone ($1\frac{1}{2}$ cwt. per acre) an average of nearly 38 cwt. per acre. Where nitrate and superphosphate or slag were used together, the average yield was nearly 46 cwt. per acre, being an increase of fully 30 cwt. of hay per acre over that of the unmanured plots. As the average cost of the manures is well under 30s., the additional yield costs under 20s. per ton to grow. The herbage on the various plots varies considerably, the best quality—a good mixture of grasses and clovers—being that found where the mixed manures are used.

Poultry.

FATTENING POULTRY.

Many people who keep poultry in the suburbs are in the habit of shutting up roosters, with the object of fattening them for table. The birds are fed usually on the everlasting maize or chick-wheat. They are often shut up for a month or six weeks, yet they obstinately refuse to get fat, and after a few weeks eat very sparingly, and instead of fattening they become thinner every day. The reason is, that no bird can bear confinement and heavy feeding for more than three weeks. Then, again, the feeding is all wrong. Maize or wheat will not achieve the object. Birds that are fattening should have very little grain food. If they are given boiled potatoes, pumpkins, and other vegetables, mixed with boiled wheat or maize, and thickened with finely crushed grain, as much as they will eat, three times a day, with plenty of greenstuff and a little meat or green cut bone, together with grit, you will see them grow and swell out. Some hold that penned cockerels should be fed frequently, but sparingly at a time, during the day. Half-fed fowls never pay. A fowl cannot get fat on a spare diet. To feed poultry requires judgment and constant attention, and since these are far from being general attainments among poultry-men, in spite of the constant advice of the Poultry Expert to the Department, conditions in many cases remain unsatisfactory to themselves and disastrous to the fowls.

OSTRICH FARMING.

Never before has there been such a call for ostrich feathers (says the "Mark Lane Express"). Dame Fashion has decreed that all girls and women who make the smallest pretensions of following her inexorable ruling must have huge plumes plucked from the ostrich in their hats. For years back ostrich farming has been one of the staple businesses of South Africa, of which country the largest living bird is a native. Now there are large farms in Florida, where the winter climate is suitable to the birds, and others in the State of New York, where the ostriches enjoy summer quarters. The stock of these farms consists of more than 200 adult birds ranging from 7 to 10 feet high, and weighing on an average 300 lb. Some of them tip the scale at more than 400 lb.

For a nest the ostrich merely scratches a hole in the sand about 4 feet in diameter and 1 foot deep. In this the hen lays one egg every other day, until about fifteen have been deposited. The eggs each weigh from 3 to 4 lb., and contain as much meat as about three dozen ordinary hen's eggs. The process and labour of hatching are shared by male and female alike. Up to the age of half a year the chicks grow at the rate of about a foot a month. Nothing grows so quickly as a healthy baby ostrich. After then the growth is much slower. Both sexes look alike, and are indistinguishable until about eighteen months old, when their feathers, which have been a mixture of grey and white, turn to dark drab in the female and black and white in the male.

Every eight months the adult birds yield a crop of feathers. The small feathers are plucked out without pain to the birds, as they are ripe when extracted, and would soon fall off. The heavy wing and tail feathers, which are the most valuable, are cut off with scissors, the stumps being left in the skin. In due time these drop out. While being plucked the bird is confined in a small enclosure, with a long, narrow bag placed over its head. Thus blindfolded, it rarely attempts to get away, but passively submits to the operation of being dendued of its feathers. The finest plumes come from the back of the wings and the tail. The male ostrich yields twenty-four fine feathers from each wing, and as many more from the tail.

The Orchard.

MAORI ON CITRUS FRUIT.

By ALBERT H. BENSON.

In many of the citrus-growing districts of the State there has been a decided increase in the number of citrus fruit attacked by this insect during the past two or three seasons. As it is one of the easiest pests to destroy if taken in time, and as it usually makes its appearance about this time of the year, I trust that these few notes respecting the insect and its treatment will be of value to citrus-growers generally.

The insect attacks all varieties of citrus fruits, but is most common on sweet and bitter oranges, mandarins, lemons, and citrons.

On sweet and bitter oranges it causes the skin of the fruit to become, when ripe, of a dark-brown colour, the amount of discolouration depending on the number of insects that have attacked the individual fruit. Thus, when the fruit is badly infested, the whole of the skin is of a dark colour, but when the infestation is slight it only produces a russity appearance of the fruit in parts. The discolouration of the fruit is not a disease, but is due to the action of the Maori insect, which is actually a tiny yellowish mite, that is sluggish in its movements, and that resembles a very small slug. These insects, when present in large numbers, injure the skin of the young fruit to such an extent that the oil glands are ruptured, and the oil, which is distributed over the skin generally, when exposed to the air becomes darkened in colour by oxidation, till in the worst cases the skin of the fruit, instead of being of a clear yellow, becomes of a dark-brown. It is not accompanied by the sooty mould fungus, and is quite distinct from Melanose, being easily distinguished from the latter disease, which often resembles it very closely in appearance, by the feel of the skin, a Maori orange being quite smooth, whereas one attacked by Melanose is distinctly rough to the touch.

Mandarins, lemons, and citrons are not attacked to the same extent as oranges, nor do the skins turn as dark, but become more of a greyish colour.

The fruit is liable to attack during any period of its growth, but it is seldom that the insects are present in any numbers on the fruit till it is at least 1 inch in diameter.

The first indication of its presence is readily detected by those who know what to look for. The skin of the fruit appears to be covered with a greyish dust, that is especially noticeable if the sun is shining direct on it; and if the fruit is then carefully examined anyone having very good sight will notice that it is covered with tiny white and pale yellowish dots. If examined under a good glass these dots will be seen to consist of the live mites and their cast-off skins, and it is the cast-off skins that give the greyish tinge to the fruit when the sun shines on it.

It is in this state that the pest should be fought, as, if destroyed now it will leave no permanent marks on the fruit; but once the fruit has turned brown, no remedy is of much good. Growers should, therefore, make themselves acquainted with the appearance of the fruit when first attacked, as, if treated then, the insects are easily destroyed, and no harm is done.

In addition to attacking the skin of the fruit, the Maori mite also attacks the young leaves and twigs, and causes their discolouration in a similar manner to the fruit.

In addition to the Maori mite, several species of so-called red spiders or spinning mites attack the fruit, leaves, and twigs, and produce effects that are very similar to those caused by the Maori, but, fortunately, the remedy that destroys the Maori is equally efficacious in their case.

The best remedy for Maori is to spray the trees with sulphide of soda in solution, either alone or in conjunction with whale oil or other cheap soft soap. A very weak solution is required to destroy the mites, but if the tree is attacked by scale insects as well, a stronger solution combined with a soap wash will be found a good remedy for both.

The sulphide of soda wash is prepared as follows:—

Boil 6 lb. of sulphur and 3 lb. of 98 per cent. caustic soda in 2 gallons of water till dissolved and it has become of a greenish brown colour, showing that a chemical combination has taken place and sulphide of soda has been produced. To this 2 gallons of sulphide of soda add from 150 to 200 gallons of water, and it is ready to apply.

For Maori, red spider, and other spinning mites this strength will be found sufficient, but where there are scale insects on the trees as well, it is desirable to increase the strength and to add a strong soap solution as well.

The soap solution is made by dissolving 30 lb. of cheap, strong soft soap in 60 gallons of water by boiling; add to this soap solution the 2 gallons of sulphide of soda; bring to the boil, and then add water to make 120 gallons, and apply warm.

In addition to its value as an insecticide, sulphide of soda is a powerful fungicide, and it is probable that it will be found to be of value as a spray for preventing Black Brand and Melanose, so that it is likely to prove a very useful remedy.

Mor Maori and spinning mites, the solution should be applied in the form of a very fine spray, and every part of the fruit, leaves, and twigs should be reached, therefore a good powerful pump fitted with a fine nozzle should be used.

DO BEES INJURE FRUIT?

Five years ago this question was much debated by orchardists and bee-keepers, and the answer has always been an emphatic "No." Once more the subject has come before us. To substantiate the assertion of the innocence of the bees, we refer our readers to an article on the subject in Vol. X., p. 108, of this Journal, and in further confirmation take the following from the "Rural New Yorker." If any of the opponents of the bee can suggest any more exhaustive experiments than the following, we should be glad to hear from him or her:—

"A house was built 16 feet long by 10 feet wide, and 8 feet high at the corners, having the sides partly covered with wire-cloth, and large screen doors in each end. The house was entirely bee-proof, and was made so that the temperature and light in the house were substantially the same as outside. Along the sides of the house were built shelves, upon which fruit was placed, so that the rays of the sun might strike the different varieties in different stages of ripeness from green to dead ripe. Plates of ripe peaches, plums, pears, grapes, &c., were placed on the shelves; clusters of different kinds of grapes, green and ripe, sound and imperfect, and such as had been stung by insects, were suspended from the rafters and cross-ties of the house. September 1st, three colonies of bees were removed from their hives, carefully and quickly, so that they would carry very little honey with them when transferred from one hive to another. Two of the colonies were hybrid bees and one Italian. These colonies were hived on empty combs, and placed in the house with the fruit. A wood

stove was put in the house, and for a number of hours each day a high temperature was maintained. The physical conditions which would ordinarily prevail in Nature during a protracted and severe drought were artificially produced and steadily maintained. The bees were brought to the stage of hunger, thirst, and starvation by these artificial conditions.

Every inducement and opportunity was afforded the bees to satisfy their hunger and thirst by attacking the fruit exposed. They daily visited the fruit in great numbers, and laboured diligently to improve the only remaining source of subsistence. They inspected and took what advantage they could of every opening at the stem or crack in the skin, or puncture made by insects which deposit their eggs in the skin of grapes. They regarded the skin of peaches, pears, plums, and other fruits having a thick covering simply as subjects for inquiry and investigation, and not objects for attack. If the skin was broken or removed they would, in case of need, lap and suck the juices exposed.

The same was also true of the grapes if the skin was broken by violence or burst on account of the fruit becoming overripe; the bees lapped and sucked the juices from the exposed parts of the grapes, and stored it in the cells for food. They made no attempt to grasp the skin of grapes with their mandibles or with their claws. If the grapes were cut open or burst from overripeness, the bees would lap and suck the juice from the exposed segments of the grape until they came to the film separating the exposed and broken segments from the unbroken segments. Through and beyond the film separating the segments they appeared to be unable to penetrate the outer skin, so it was removed from many grapes of different kinds, taking care not to rupture the film surrounding the pulp. When these were exposed to the bees they continued to lap and suck the juice from the outer film until it was dry and smooth, as was the film between broken and unbroken segments. They showed no disposition to use their jaws or claws, and the outer film as well as the film between broken segments remained whole until the pulp decayed and dried up.

After continuing this test for thirty days, using such varieties of fruit as could be obtained, twenty varieties of grapes were secured from President Lyon, of the Michigan Horticultural Society, and the grapes arrived in excellent condition. Another colony of Italian bees was then placed in the house, with those already confined, for forty days, and the twenty varieties of grapes were exposed upon plates and suspended from the rafters as before. The conditions naturally prevalent during a severe and protracted drought were again produced, and the test again continued twenty-five days. The result was simply a repetition of the former test. The bees showed no more capacity or disposition to offer violence to one variety of grapes than another. No more attention was given the thin-skinned varieties than the thick-skinned. As long as the skin remained whole, they did not harm the grapes. When the skins were broken by violence, such as by cutting or squeezing, the juices exposed were appropriated. In order to determine the size of the opening necessary to be made in order that the bees might injure the grapes, the skin of the grapes in several bunches was punctured with cambric needles of various sizes. The puncture made with the point of medium-sized needles produced no effect. Neither did the puncture made by the sting of insects when ovipositing, until the blister appeared and decay had progressed, with the development of the insect larvæ. It was found that a medium-sized needle might be passed through the grape from side to side, and the bees might obtain no juice except that oozing from the puncture. Many erroneously suppose that bees sting the grapes. But they never sting except in self-defence or in defence of their homes. At times when bees could gather nothing in the fields, clusters of grapes were saturated with honey and suspended in front of hives in the apiary, and from the branches of trees and grape vines near by. Other clusters dipped in honey and syrup were hung in the house. The bees thronged upon the grapes until the clusters looked like little swarms hanging to the vines and limbs. They lapped the

grapes until the skins were polished perfectly smooth and shining, and no taste of sweet could be detected by touching the tongue to the grape. The skins of the grapes were left intact.

Taking advantage of the propensity of bees to steal, combs containing honey were placed in an unoccupied hive, and the bees in the apiary were permitted to steal the honey and such portions of the combs as they could appropriate. Then clusters of grapes dipped in honey were suspended instead of the despoiled combs. The bees attacked these with desperate earnestness, apparently determined literally to go through those grapes.

The clusters were left hanging for a day or two, until the bees had entirely destroyed the hive, and an examination showed the clusters to be as sound as when placed there, and the skin polished smooth and clean as before. After passing a darning needle through some of the grapes in several clusters of different varieties, these clusters were suspended from the top of comb frames by using fine wire, and were then placed in the centre of strong colonies of both hybrids and Italians. The juice was extracted from the puncture segments as before, and the perfect grapes hung undisturbed for fifteen days. They appeared to have kept better hanging in the hive than they would have kept on the vines.

The above experiments were made in 1885, and the next year were repeated with two colonies of Italian bees, two of hybrids, one of Corniolons, and two of Syrias. Grapes were again obtained from Michigan, and some of the bunches were dipped in syrup and hung in the hives between the combs. The bees lapped and sucked all the syrup from the skins, leaving the berries smooth, and not breaking the skins. The experiments showed that honey-bees are not only unable to penetrate the skin of the grape, but they also appear to be unable, even when impelled by direst necessity, to penetrate the film surrounding the berry, even after the skin is removed. Grapes so prepared, without exception, laid before the hives until dried up. Clusters of sound grapes which were hung between the comb frames in hives occupied by strong colonies were unbroken and sound after fifteen days' exposure in the hives; the skins were polished smooth, but none were broken. Again, the entrance to several hives containing good-sized colonies, both in the apiary and in the wire-covered house, was closed by pushing sound grapes into the opening so close together that the bees could not pass through. By this means the bees were confined to the hives for days in succession, not being able to break down and remove the grapes, and, although the skins of the grapes next the inside of the hive were polished smooth, none were broken or injured.

EXPORTING MANGOES.

Under this heading (says the "Journal d'Agriculture Tropicale" for September), "Country Life in America" for February has published an article on the qualities of mangoes. We notice, in the Dutch translation given in the "Teysmannia," the following passage:—"Although the fruit quickly decomposes, it can sustain fairly long transport, and it is sent from Bombay to London. The best plan is only to send fully ripe fruit. When it is not sufficiently ripe on being gathered, as happens in India, it is packed in hay."

Here we have something which contrasts singularly with the authoritative opinion of our correspondent, M. E. Leclerc, who, notwithstanding infinite precautions, has not been able to preserve the fruits for a voyage extending over more than a few days. As far as maturity is concerned, we should be surprised if the hay did not sensibly accelerate it, as it does in the case of most European fruits. Furthermore, a mango gathered before maturity must, like every other fruit, lose much of its flavour. Our correspondent even stated that, under these conditions, it softened without ripening. We should be rather more inclined to accept this statement than that of our American *confrère.*

Tropical Industries.

SISAL AND MAURITIUS HEMP.

In view of the expansion of the Sisal fibre industry in Queensland, and of the certainty of its forming within a few years one of the imports and exports of the State, too much prominence cannot be given to all reliable information on the subject. The pamphlet on sisal culture issued by the Department of Agriculture and Stock supplies intending planters with full information as regards the industry in Queensland and other countries. It is, however, well to learn what new features now present themselves relating to this important industry. A very interesting article on Sisal and Fourcroya fibres appeared in the "Natal Agricultural Journal" for 26th July, 1907, embodying the experience and investigations into the subject of Mr. T. R. Sim, F.L.S., Conservator of Forests, Natal, from which we take a few extracts. The first portion of the article deals with the various descriptions of Aloes, Agaves, and Fourcroyas and their different fibres, it being stated that the latter plant is widely distributed in Natal. Concerning its value as a fibre producer, Mr. Sim writes:—The advantage of Sisal over Fourcroya is not such as to prohibit the Fourcroya being profitable. On the other hand, the earlier yield of leaves and the longer duration of life seem to favour the Fourcroya, and, taking total production, percentage, and longevity and price into consideration, it seems to me likely that Fourcroya will give the better returns here on reasonably good soils, though the Agave may do so on the lighter and more sandy soils. Neither can be expected to be a commercial success where any frost occurs, though both will live through a few degrees of frost; both suffer severely from fire, especially when young, if weeds among them are allowed to burn. Both require land which is well drained, or in wet soil to be on the top of a bank and so free from stagnant moisture at the roots. The distance apart at which the plants are planted depends on the soil; the poorer and drier the soil, the more plants per acre are required. In a recent article on Sisal culture in the Philippine Islands, where the usual espacement is 3 feet x 3 feet, the writer says:—"The Philippine planter, thinking to increase his crop, puts out three times as many plants to the acre as needed, and as a result gets less fibre per acre than if he spread the same number of plants over treble the amount of land." The same writer is very strong upon the injury done to the plants by commencing to harvest when the plants are immature, and also by cutting too large a proportion of the leaves off every year. Such undue harvesting weakens the plant, reduces the quantity and quality of fibre in future years, and produces early poling. The treatment of Mauritius hemp in Mauritius is given in the "Natal Agricultural Journal," December, 1906, page 1,204, where 4 to 5 feet espacement is mentioned, but experience elsewhere, though mostly in other species, indicates the advantage of wider espacement, especially where mechanical cultivation is employed.

With such a heavy product as Agave or Fourcroya leaves, which may run to 30 tons per annum per acre from mature crop, it is necessary when laying down a plantation to consider carefully how the transport is to be done, and to arrange accordingly. The use of an efficient tramway system may be said to be an absolute necessity, permanent along the mains, and with movable sections as feeders. For the use of these the physical configuration of the estate must be studied, so as to arrange, even before planting, for leaving unplanted the contoured roadways which will be necessary several years later, and for securing with these the greatest service by the shortest route consistent with safety. The selection of the site for the mill must also be guided by this, together with the presence of water for power and washing.

The exports of Fourcroya fibre from Mauritius in 1905 were:—

	Tons.
To the United Kingdom	1,217·2
To France	393·5
To Germany	27·3
To Belgium	8·4
	1,646·4

In 1903 they were 1,491 tons, of the value of about £45,936 sterling. This fibre is not exported on a large scale from any other country.

SISAL PRODUCTION AND CULTURE.

Professor Dunston remarks concerning the production and export of sisal:—

"It is difficult to obtain trustworthy statistics with reference to the production and consumption of sisal hemp, but the following are probably fairly correct.

"In 1903, the following quantities were imported into the countries mentioned below:—

	Bales.
United States of America	575,167
Cuba	8,066
United Kingdom	4,286
Canada	1,200
France, Spain, Germany, and Belgium	1,711

"The average output in Yucatan during the ten years ending December, 1901, was 416,328 bales, or about 74,000 tons (each bale weighing about 400 lb.) In 1903 the production amounted to 590,430 bales (about 105,000 tons),* and in 1905 to 597,289 bales (about 106,660 tons).

"The amount produced in the Turks and Caicos Islands is small; in 1902 the quantity exported was about 223 tons, of value £7,100; in 1904 and 1905 the value of the exports was £6,886 and £5,803 respectively; nearly the whole quantity goes to the United States of America.

"The Bahamas in the year 1902-03 exported about 1,047 tons, worth £37,524; in 1904, the exports were 990 tons, value £29,557; and in 1905, 1,357 tons, value £37,522. Small quantities are also exported from India. The production in German East Africa was mentioned in my letter of 4th March. [1,000 tons.—Ed. "Q. A. J."]

From the Philippines the export of fibre in 1901 was 875 tons, and in 1905 1,878 tons.

The cultivation of sisal is also being taken up in New Guinea, the Tonga Islands, Hawaii, &c.

Concerning the sisal imported into India in 1892, and which was supplied by Messrs. Reasoner Brothers, Oneco, Florida, the larger portion went to the Dauracherra Fibre Company, Cachar, which is now the largest fibre company in Assam.

From a summary of a report by Mr. F. G. Sly, the Acting Inspector-General of Agriculture in India, as recorded in the "Madras Mail," we learn:—

"The estate in question, on which about 1,000 acres are planted with sisal, has a rainfall of 80 inches fairly well distributed, which is favourable to the continuous growth of vegetation; and sisal, Mr. Sly says, as far as he could learn, has no prolonged period of rest. The soil on this estate is a fairly good loam, and by no means poor, being virgin land which was under a dense growth of mixed forest before it was reclaimed. Clay soils are unsuitable; shade is bad; and any water-logging is fatal. As regards the planting out of sisal, so far

* Value, £3,333,114 sterling.—T.R.S.

from dumping in plants anywhere and anyhow on a wet day, as I have seen recommended, Mr. Sly prescribes the following careful treatment:—The young plants should be at least 1 foot high, and even longer, if possible. All weakly plants should be discarded. Pits should be dug about 1 foot deep and 1½ foot square. In the earlier years the plants in Assam were set out too far apart; the most economical distance is now said to be 9 feet x 4½ feet x 4½ feet—*i.e.*, two rows 4½ feet apart, with 4½ feet between the plants in the row, and then a space of 9 feet for convenience in cropping the leaves."

In view of the comparatively heavy rainfall mentioned above, it may be necessary to reassure Natal planters by stating that where the sisal is cultivated in Yucatan the rainfall is very low, and Mr. T. W. Wells, a Queensland grower of sisal, remarks in a pamphlet on the subject:—

"Though excessive rains, no doubt, are not beneficial to sisal, except to make it grow faster, they are not very injurious if the land is naturally drained; but sisal does not like wet and water-logged ground. . . . It is the fair to good lands, especially those of limestone origin, situated in dry districts, to which we should, I think, turn our attention for sisal-growing."

In regard to a series of samples of fibre sent from India and grown at Madras, Bangalore, and Chickmagular (*i.e.*, at sea-level and at 3,000 and 4,000 feet above sea-level respectively), the following particulars are given in the "Bulletin of the Imperial Institute," taking the standard of the strongest as 100, though it must be noted concerning the values that, as the samples were from different places and not equally prepared, the valuation may have been affected by that:—

Sample.	Comparative Strength.	Approximate Value in London—per Ton.
No. 4.—Agave sisalana	100·0	£31 to £32
No. 3.—Agave sisalana	87·5	£29 to £30
No. 6.—Furcrea gigantea (badly prepared)...	81·0	£23 to £24
No. 2.—Agave vera-cruz (badly prepared) ...	62·7	£22 to £22 10s.
No. 5.—Agave Wightii (short fibre)	57·9	£22 to £23
No. 1.—Agave vera-cruz (badly prepared) ...	55·3	£24 to £25
But if well prepared...		£26 to £28

The species named *A. vera-cruz* above is similar if not identical with what we call the American aloe, but as the synonymy of both Agave and Fourcroya is desperately and almost inextricably mixed, and as several almost similar species of the Americana group are widely different in their fibre values, it is not safe to assume that the above figures indicate either the comparative strength or comparative value of our American aloe.

But it is common experience that any difference in the preparation of the fibre affects its value, and in this respect one sample sent to the S.A. Products Exhibition with a green colour was found to be considered unfit for market, though of fair length and cleanness in other respects.

In order to secure better colour, the following advice is given by the "Queensland Agricultural Journal":—"When the Agave leaves are passing through the machine a slight stream of water should play on them as they pass under the beater bars. On leaving the machine the fibre will have a slightly green tinge, which passes away when the material is hung up in the sun for a couple of hours. It will then appear white and lustrous, but there will still be a certain quantity of gummy matter adhering to the fibres. This can be easily got rid of by washing the fibre for a few minutes after it leaves the machine. All imperfectly cleaned fibre, having still some of the green cuticle or flesh of the leaf attached to it, should be kept separate."

MACHINERY NECESSARY.

The extraction of the fibre from any of the kinds already mentioned is not of itself a difficult matter, but still the method of harvesting and extraction generally rules whether a planter will have profit or loss in the business.

The old Mexican method, which is still in use in some places, is simply a knife fixed at one end and a block of wood; between these the fibre is drawn by hand, and the process is repeated and more pressure applied to the free end of the scraper till the scraping is considered complete.

The next improvement on this is what is known as a raspador in Mexico and as a gratte in Mauritius, the principle in each case being a rapidly revolving drum, on which cross-bars are fixed at such distances that when the leaf is pressed under this the cross-bars scrape off the green flesh of the leaf, leaving the fibre more or less clean. These machines are usually encased so as to prevent the acrid juice being thrown on to the workmen.

Numerous improvements on these raspadors have been made, but the principle of all continues to be almost the same, and with the exceedingly cheap labour of Yucatan an enormous amount of fibre still continues to be extracted by this means.

But the Mexican plant being mostly Sisal, while ours is mostly Fourcroya at present, it is better to follow the Mauritian method, where also Fourcroya is used, and where, on account of the thickened lower portion of the leaf, it is found necessary to use a beater to bring that into form before feeding the leaves to the gratte. In reply to my inquiry, I have the following information from the firm who were recommended to me by the Director of Forests and Gardens in Mauritius—viz., Forges and Fonderies de Maurice, Port Louis, Mauritius:—

"In reply to yours of 10th January, we have pleasure in enclosing herewith two blue prints, one showing a pair of scrapers such as are exclusively used by manufacturers here in the preparation of aloe fibre. The print* shows one scraper enclosed in its wrought-iron sheet guard, and the other with the guard partly broken away to show the scraper blades fixed to the drum. The driving pulley lies between the scrapers, and serves to drive both. In this arrangement it will be seen that the output of fibre may be increased as may be desired, by the addition of other pairs of scrapers without in any way retarding the working of such as already may have been installed. The view shows the back of the scrapers with outlet doorways in the brick foundation for the removal of all waste products, pulp, water, &c. In the front of the machine are arranged two feeding tables, upon which the aloe leaves are fed into the scrapers. The beater is of similar design to the scraper, but with fewer blades and different arrangement of feeding. It has been found here that with an installation of four scrapers and two beaters about a ton of aloe fibre can be prepared in one day of eleven hours."

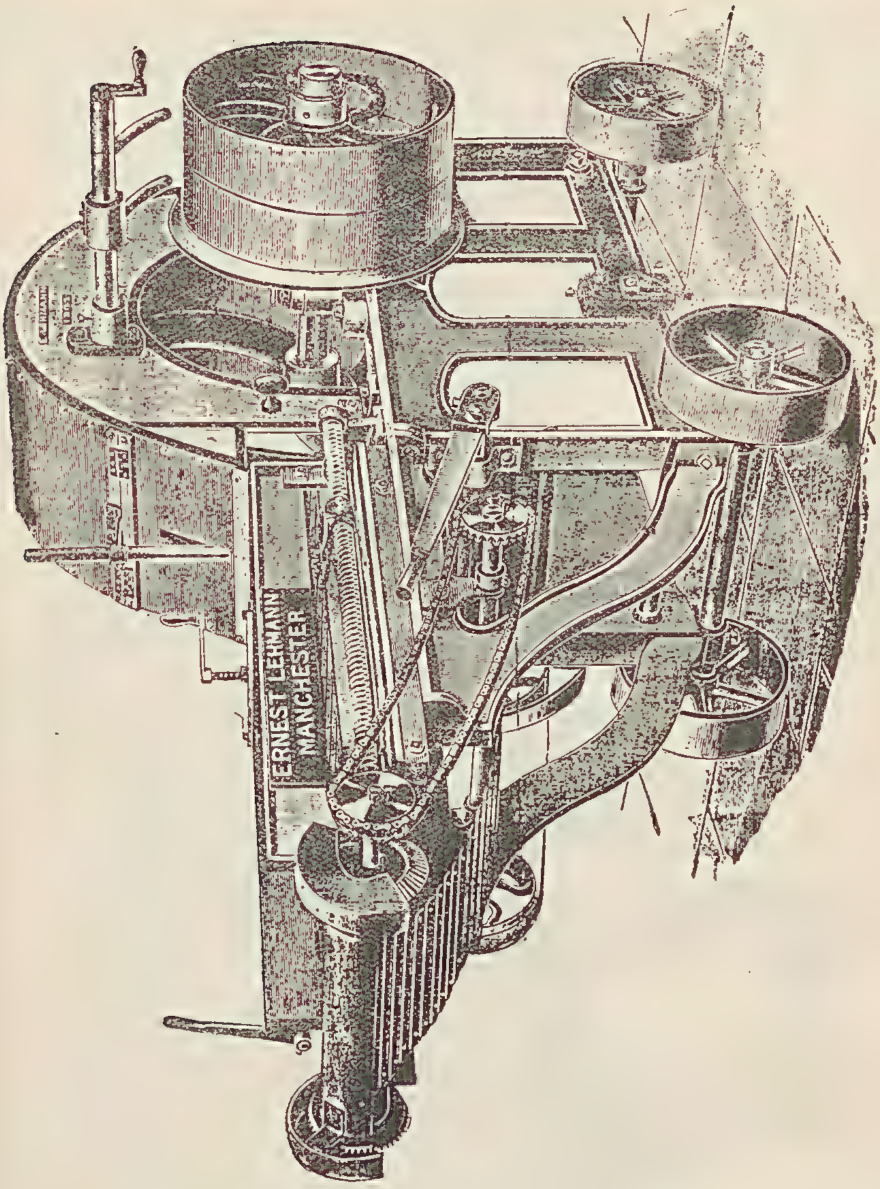
And they append the following quotation, f.o.b., Mauritius Harbour:—

	£	s.	d.
One pair scrapers, with shaft, pulley, and plummer blocks	45	15	0
One beater for ditto	26	16	0
One twin-screw baling-press	62	2	0
	£134	13	0
$2\frac{1}{2}$-inch turned shafting, per foot	0	5	4
Coupling boxes for ditto, each	1	12	9
$2\frac{1}{2}$-inch plummer blocks, each...	1	16	0
39-inch pulleys, each	3	12	0

It has already been mentioned ("Natal Agricultural Journal," December, 1906, p. 1205) that for the African coast, where the aloe plant reaches much greater sizes than in Mauritius, special machinery has to be provided for, and orders can be sent accordingly.

Most, if not all, of the aloe fibre machines in the market require steam or other gear, but mechanical ingenuity has been much exercised in the direction

* Reproduced.—T.R.S.

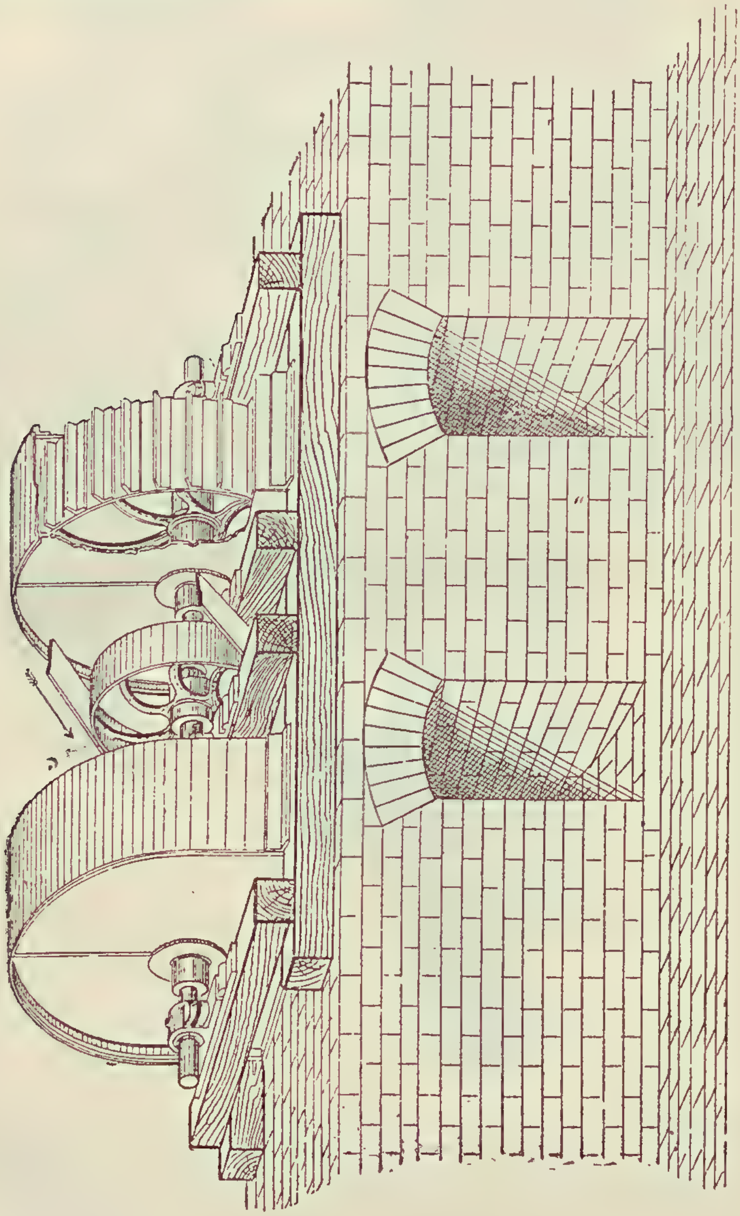


Lehmann's Extractor for Sisal Fibre.

of producing a machine which will clean a large amount of fibre with only a small number of men in attendance, and thereby reduce the cost of cleaning. Year by year fresh machines, claiming to be improvements in this respect and also in simplicity, are put upon the market, and since the companies and planters now putting down fibre plantations will not be in want of machinery for three years at least, there seems little practical benefit meantime in reviewing the machines in use, further than to allow planters to have an idea what the extraction costs, and so form an estimate of prospective profit.

Leaving out the cost of power, the Mauritius outfit of four scrapers already mentioned would cost about £200, and treat the produce of, say, 250 acres. On the Dauracherra Estate (India) already mentioned the machine is a Torroella, costing about £600 there, and expected to deal with 600 to 800 acres of sisal.

Extractor No. A, illustrated herewith, made by Mr. E. Lehmann, of Manchester, is stated to weigh 21 cwt., to require 2-h.p., and to produce about 750 lb. of fibre per twelve working hours. Cost, £65; or on wheels, £75. He also makes a hand-power machine at £35.



Twin Drum Aloe Fibre Scraper as made by Les Forges et Fonderies de Maurice, Port Louis, Maurice.

Mr. T. Barraclough, 20 Bucklesbury, London E.C., makes several machines from about £30 up to £400, which latter is his "special" fibre-extracting machine, and is calculated by him to be able to produce 3,150 lb. of dry fibre per day.

Messrs. Death and Ellwood, Leicester, produce a small hand-power machine at £45 and a larger machine at £60, and one still larger. The Todd machine, largely used in the Bahamas, costing, with steam engine and steam press, about £1,000, is made by Mr. T. C. Todd, of Patterson, New Jersey, U.S.A., the leaves

enter the machine sideways, and it is claimed to turn out 1,500 lb. of fibre in a day. Mr. A. C. Harris, Leicester, supplies a machine; and Mr. M. F. Fasio, 56 Rue d'Isly, Algiers, is manufacturer of "La Portative" for hand or steam power.

The following machines are stated by the "Queensland Agricultural Journal" to be in actual use in Yucatan:—

Machine.	Number of Leaves Cleaned in 10 Hours.	Actual Horse Power.	Number of Men Needed.	Cost. £	Number in Use.
Lanaux	130,000	35	3	571	6
Prieto	125,000	60	3	664	90
Stephens	150,000	70	3	1,047	6
Solis (Raspador) ...	9,000	6	2	24	1,200
Torroella	80,000	30	3	476	20
Villamor	70,000	35	3	571	?
Death and Ellwood	20,000	$3\frac{1}{2}$	2	130	?

From the above it will be seen that there are machines in the market to suit all sizes of estate and pocket. But it is usually claimed that the larger machines save labour enormously. It seems to me that on an estate large enough to require a resident engineer that may be the case, but that on smaller estates the chances of breakage and consequent delay and cost of repairs make the simplest machines claimed the most economical, and allow for the extra boys required. It is also claimed that some machines give a higher percentage of good fibre than others—*i.e.*, they destroy less and consequently produce less waste of fibre. As this can hardly be proved except by machines working side by side on fibre produced on one part of one estate only, the statements in regard to this should be received with caution, except an evident and undue waste occurs.

Taking the fibre industry as a whole, there appears to be every prospect that it will prove a valuble asset to Natal, and to those who carry it on. If systematically and economically worked with the right kinds, success is assured, but the most important point at the present juncture is to see that the best kinds, and these only, are used.

Wattle-growers know the difference in profits yielded by silver wattle and black wattle respectively, and still neither the analysis nor the rate of growth gave early planters an indication that there was much difference. So also the golden wattle, with its higher percentage of tannin, is found less suitable to Natal than the black wattle.

That there is a decided difference between the yield and value of fibre produced by different but very similar Agave and Fourcroya kinds is well known, and the first duty of the planter is to make sure he has the right kind, and then plant so as to suit economical harvesting, leaving machinery out of close consideration until he is ready to use it.

DATES AND THE DATE TRADE.

Many parts of Queensland, especially the Western country between Rockhampton and Longreach, are eminently adapted for the production of dates, and date palms may be seen at and in the neighbourhood of Barcaldine bearing heavy crops of fruit, yet imported dates are sold all over Queensland. Date-growers in Basra (Palestine), between the Tigris and Euphrates, have been getting big prices for their dates in London. Although the export of the fruit in 1906 was less than that for 1905 by 9,684 tons, yet the increase in value was £91,328. The "Indian Trade Journal" says:—

The date crop was middling as regards quantity, probably from 25 to 30 per cent. less than that of a good average year. The crop of an average year is now barely sufficient to meet the increased demand for dates in Europe and

America. Hallawees and Khadrawees fell short, and this, coupled with American competition to ship the largest possible quantity of early fruit, caused the market to open at very high prices, viz.:—Per kara of 40 maunds (54½ cwt.), Hallawees, 400 shamis* (£23 6s. 8d.), or £8 11s. 3d. per ton; Khadrawees, 320 shamis (£18 13s. 4d.), or £6 17s. per ton; Syres, 240 shamis (£14), or £5 2s. 8d. per ton. Hallawees subsequently rose to 480 shamis (£28), or £10 5s. 6d. per ton. The prices are unprecedented. Syres fell to 160 shamis (£9 6s. 8d.), or £3 8s. 6d. per ton. Exporters incurred heavy losses on the advance sales of Hallawees and Khadrawees made in the London market in June and July. Prices of dates in London rose in sympathy with the market at Basra. When early sellers found that the cost of Hallawees and Khadrawees did not permit their being shipped at a covering price, they brought them back and packed Syres, with the result that a large quantity of Syre dates is still left unsold in the London market. The total export of dates in cases was 1,450,557 cases, being 492,956 more than last year, an increase in quantity of 12,324 tons, and in value of £149,047. The chief shipments were as follows:—

—	Quantity.	
	Cases.	Tons.
London and Mediterranean ports ...	770,000	19,250
America ...	450,000	11,250
Australia, etc. ...	30,000	750

Owing to the high prices commanded in Basra, the export of dates in baskets to India decreased more than 50 per cent., to 326,376 baskets against 663,730 baskets in 1905, a reduction of 22,772 tons. The shipment of dates in bags was 25,058 bags, or 1,723 tons, as compared with 1,582 tons in 1905. The shipment of dates in skins was 42,008, or 2,048 tons, as against 1,425 tons in 1905.

No trouble has ever been taken to fertilise date palms in Queensland as is done in Arabia and in North Africa, yet they bear astonishing crops. We have seen as many as six clusters of dates on one palm at Barcaldine, which must have held from 4 to 5 cwt. of excellent dates.

SYNTHETIC CAMPHOR.

The advance in the price of natural camphor during the last few years (says the "Journal d'Agriculture Tropicale") has given rise to innumerable experiments with the object of obtaining a product by which European and American industries, especially that of celluloid, will not be dependent on Japanese production, which is a monopoly and also inadequate to the world's requirements. The results which have been obtained in this direction are of the greatest interest to the producers of natural camphor, as the future of their enterprise would be irremediably compromised by the manufacture of synthetic camphor. What are the results which have been arrived at so far? For a long time chemists have produced synthetic camphor in the laboratory. The first to obtain it was Berthelot, by oxidising borneol. All that is needed is to treat this substance with nitric acid. Borneol, or camphor of Borneo, is an alcohol belonging to the same chemical series as ordinary camphor. About twenty years ago a more complete synthesis was carried out by Bouchardat and Laffont from the essence of turpentine extracted from the *Pinus maritima*. From this they obtained by the action of benzoic acid an isomere of borneol, which they turned into camphor by oxidisation. In 1888, Laffont attained a similar result by operating on the essence of American turpentine extracted from the *Pinus australis*.

* One shamis = 1s. 2d.

The camphor obtained by these chemists is capable of replacing in various employments the natural camphor, of which it possesses all the chemical properties. The various isometric states of borneol which yield as many isomeres of camphor only differ from each other in their action on polarised light.

Since these discoveries, industrial researches have been fairly numerous. Industries have been established with the object of profiting by certain results of these researches, and of exploiting industrially the manufacture of synthetic camphor.

Amongst these should be noted an American enterprise—viz., the "Porchester Chemical Company," whose patent, taken out four years ago, follows in general the principal established by Laffont. Desiccated oxalic acid at a suitable temperature is caused to act on the essence of anhydrous turpentine. The action which is of greatest interest to us takes place on the pinine of the essence of turpentine, terebenthene or australene, according as it refers to the French or American essence.

The mixture is treated with lime; the borneol is separated by distillation; dissolved in the oleaginous products of the reaction and of the camphor, then two bodies are produced. By pressure in a filter-press, all trace of oil is eliminated from the camphor, after which the borneol is oxidised into camphor by means of a special apparatus.

According to Mr. Fred. Collins, the yield of camphor amounts to from 25 to 30 per cent. of the essence of turpentine used in the process, which lasted for fifteen hours. Finally various other products were obtained as well; natural terpenes, essential oils, some of them having an agreeable odour.

A factory was installed with special appliances adapted to the different phases of manufacture. This brief description of the process shows that it is to-day a question of manufacturing a camphor having the same chemical formula as the product of the *Cinnamomum camphora*, $C_{10}H_{16}O$, and not what the chemists call *artificial camphor*, which is a monochlorhydrate of turpentine $= C_{10}H_{16}HCl$.

Much has been said recently about a French patent, which is being exploited by a company.

Taking this latter process and all other things into consideration, the indications so far warrant the belief that the competition with synthetic camphor is not to be feared.

Here we have a period of twenty years since the manufacture of synthetic camphor was understood. More than four years ago a factory for its manufacture was established, yet the cost of the material has more than trebled, a proof that the artificial product has in no way influenced the market.

This arises doubtless from the fact that no economical process for the production of synthetic camphor has yet been arrived at. It all depends on the price of the raw material and of the by-products evolved from it. In all the known processes the primary material is essence of turpentine, and the utilisable by-products have an analogous outlet. Now, essence of turpentine is worth 1 franc to $1\frac{1}{2}$ francs per kilo (10d. to 15d. per $2\frac{1}{5}$ lb.), which would admit of producing camphor at 5 francs (4s. 2d.) per kilo. But, as we have seen, the maximum yield of camphor is scarcely a third of the weight of the essence used. Will the production of essence of turpentine suffice, without increase in price, for the increased production? It is very doubtful, and the more camphor that is made the more the price of the primary material will increase. The consequence is that an industry furnishing a normal output would not appear to be able to maintain the price which had been based upon experiments on small quantities.

These, then, are the reasons why many chemists consider that natural camphor has still a good lease of life before it, and the time has not yet arrived to, as some have said, cut down the camphor laurels to plant the producers of essence of turpentine—the pine trees.

A far more serious discovery, as far as the interests of the producers of natural camphor are concerned, has lately been announced. It is said that experimenters have succeeded in replacing camphor by naphthaline and by various other substances in the manufacture of celluloid. Celluloid made with naphthaline particularly has, it is stated, the same properties as that made with camphor. Should this discovery be confirmed, it will enormously prejudice both natural and synthetic camphor, as the price of naphthaline leaves a very wide margin to cover in order to reach the present price of camphor.

TO RECOVER WASTE RUBBER.

It is known in the rubber trade that there is "perished" rubber, which has lost its essential qualities, and yet in which a good proportion of live rubber exists. A process is being worked in France, whereby it is claimed all the effective rubber can be recovered from this waste by dissolving it in "terpineol," either cold (which is rather slow work) or under a gentle heat, say, about 100 C., which is not enough to injure the qualities of the material. It is claimed that the process is not expensive, because the solvent can be used over and over again; meanwhile the very high value of new rubber (says the "Home and Colonial Mail") would justify even an expensive method of recovery.

THE FIBRES OF LONG-STAPLE UPLAND COTTONS.

(Issued by the Bureau of Plant Industry, United States Department of Agriculture.)

By H. A. ALLARD, Scientific Assistant, Cotton Breeding Investigations.

Uniformity of Cotton Fibres.

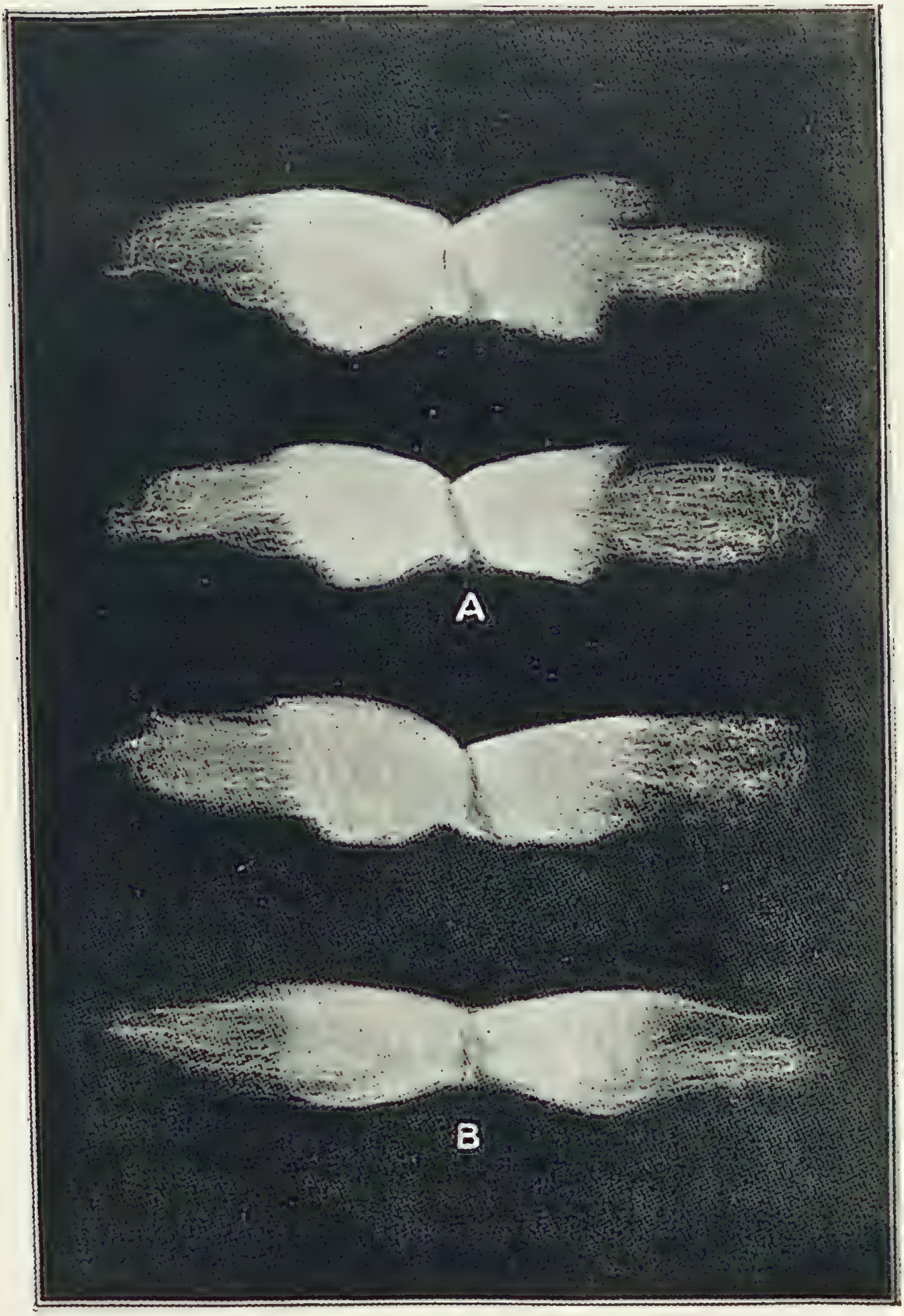
In investigations in cotton-breeding, where an improvement in certain lint characters is desired, several factors must be carefully considered. Among these, some of the most important are fineness of lint, the relative yield of lint to the total yield of seed cotton, and the uniformity of length of all the fibres when properly combed out and examined. The last character, uniformity of length, is a most important one, and has much to do with subsequent waste and the production of good yarns in the process of manufacture.

On Plate XXX. are illustrations of cotton seeds with fibres combed out to show uniformity and non-uniformity in the length of the fibres. The seeds to the left (A) show very poor uniformity, and are of the "butterfly" type, as they are commonly called. In marked contrast, the seeds to the right (B) show excellent uniformity as a result of several generations of careful selection.

Apparent Lack of Uniformity and its Occurrence.

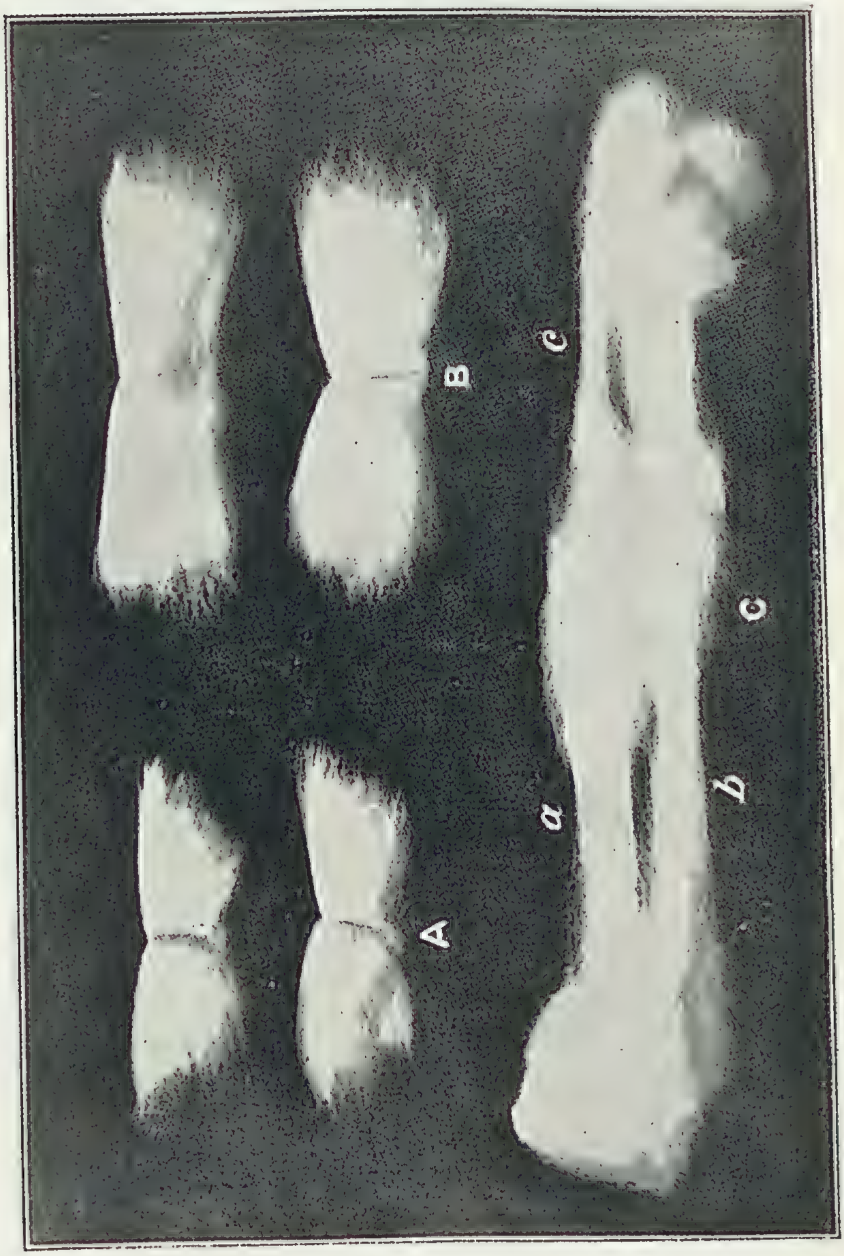
There is an apparent lack of uniformity which deserves considerable attention from the standpoint of cotton growers and breeders. Plate XXXI. illustrates this character, although it is more strikingly brought out in the operation of detaching the seed from the lock. From the illustration, there would appear to be a great lack of uniformity, due to a group of fibres about twice the length of the general covering. This group arises from the centre of the main body of fibres, or, often, from those having a point of attachment near the larger end of the seed. This character is usually associated with the finer, more crinkly types of long-staple cottons, such as the fine, long-linted Egyptian

Plate XXX.



Fibres of Long-staple Uplands Cotton.

Plate XXXI



Fibres of Long-staple Uplands Cotton.

and Sea Island varieties and the long-stapled Upland varieties—Griffin, Allen, Cook, &c. It is a character which becomes more apparent as a variety is being rigidly selected generation after generation for finer, longer staple. This has been well-illustrated in the improvement of the lint characters of the Russell variety and, to some extent, the Jones variety. The original condition of both of these varieties is remarkably free from this so-called longer group of fibres. In the case of the greatly improved Russell strain, which has become distinctive enough in good lint characters and yield to be designated as a new variety —the so-called Columbia cotton—these longer fibres are evident to a remarkable degree.

The True Nature of the Longer Fibres.

It has been more or less the rule with cotton-breeders and cotton-growers acquainted with the requisites of desirable lint characters to regard these extra-long fibres as an unfavourable feature. In this light they meant a variation toward non-uniformity. In the work of selection, to avoid as much as possible a perpetuation of this sort of variation, plants showing this character most markedly were regarded with suspicion, and later even discarded, although in other respects they were among the best in the field.

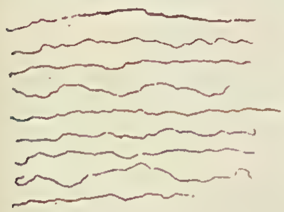


Fig. 1.—Single cotton fibres from the so-called longer group of fibres.

A careful examination leads to the conclusion that these fibres should be regarded in a wholly different light. They are not longer fibres, as they have been generally considered, but are caused by more or less curling and interweaving, which results in the pulling out of fibres from adjacent seeds.

In the ordinary manner of stretching the locks to determine the drag, the fibres are slowly separated and drawn out, and at those points of greatest binding, as shown in Plate XXXI., C, *a*, *b*, and *c*, the groups of longer fibres appear to rise. If, now, a single seed is selected and detached from the rest and the entire group of fibres loosened from its attachment to the seed coat in the neighbourhood of the longer groups, one can with fine forceps draw these fibres out carefully and compare their length with those of the rest of the seed.

In many instances the single fibres now readily separate, since the tension of pulling has ceased. Several of these single fibres are shown in Fig. 1. In some instances fibres nearly twice the normal length are drawn out. Oftentimes with the naked eye the point of union or tying may be discerned by the tiny loose ends, as is shown in Fig. 2. In other cases, however, this point of union is so intimate that only a high microscopic power can make it evident. Fig. 3 illustrates various degrees of this tying or curling together, as seen when greatly magnified. In Figs. 1 and 2 single and united fibres, respectively, of natural length are shown, but the diameters are of necessity much greater than normal, owing to the exceeding fineness of the fibres.

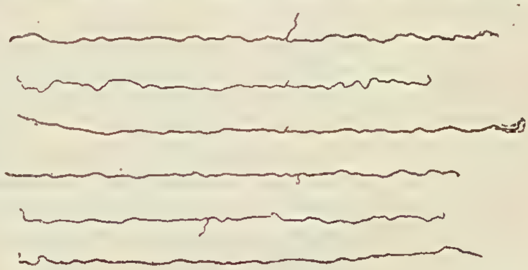


Fig. 2.—A few extra-long cotton fibres, showing two fibres united.

The drag of cottons showing the longer fibres previously described gives a more extended, elastic tension than is manifest among the short-staple varieties. It is probable that breeders may find this character a useful one in indicating a tendency toward increased length, fineness, and crinkliness of staple in the individuals in which it occurs most noticeably—an indication of better spinning quality.

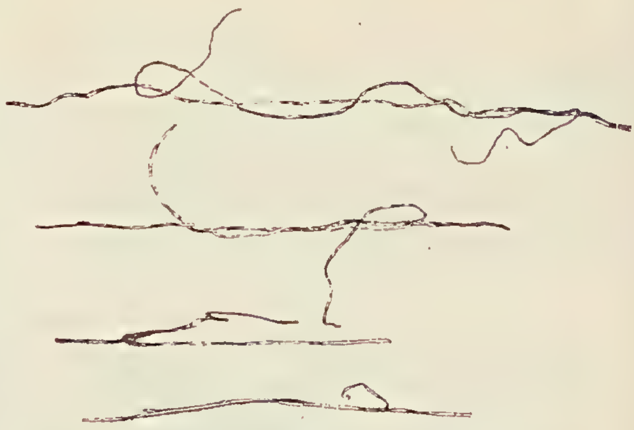


FIG. 3.—Cotton fibres tied together, very much magnified.

It is important that breeders and growers of long-staple cottons should know that these apparently longer fibres are no indication of true lack of uniformity. The presence of these fibres in the long-staple Upland varieties has quite universally led to the erroneous belief that such cottons are rather inferior in uniformity as regards length of fibres. The Griffin cotton, in particular, recognised in other respects as the best long-staple Upland cotton grown, has always been described as decidedly unsatisfactory so far as uniformity in length of staple is concerned, since the drawing out of fibres from adjacent seed is a marked characteristic of this variety.

A knowledge of the true nature of these longer fibres will clear the reputation of some of the best long-staple Upland varieties of a serious fault hitherto wrongly attributed to them by all breeders and growers.

MOLES FOR THE CANE GRUB.

A few years ago we advocated the introduction of moles for the destruction of the cane grub, but we were met by the assertion (by men who had never been out of Queensland, and hence had never seen a mole or studied its ways) that the little animal would gnaw the roots of the cane plants, destroy the plantations, and eventually become as great a pest as rats or the grub itself. Such reasoning is dogmatic, absurd, and is advanced in absolute ignorance of the habits and structure of this harmless animal. We lately came across the following extract from the "Agricultural Gazette," London, and we give our readers the benefit of it, in the hope that some planter of advanced ideas will be induced to give the creature a trial, provided, of course, that departmental sanction be given to the importation of, say, one single pair, which could, with their first progeny, be easily "deported" in the event of their not fulfilling expectations:—

VORACITY OF THE MOLE.

In the first place, there is probably no animal going, domesticated or *feræ naturæ*, so voracious as a mole. It will eat the larvæ of cockchafers (a most injurious insect), all kinds of worms indiscriminately—useful and injurious—frogs, toads, &c., more than its own weight in twelve hours; and experiments have proved that if a mole cannot obtain food for that period it will perish. The mole is, therefore, of the glutton tribe, and for that reason I have never known moles to exist in any particular district in numerically plague form. Besides, the mole has many natural enemies, "Nature's police," such as weasels, stoats, owls, kestrels, buzzards, &c., and if these were not ignorantly and wantonly destroyed the mole-catcher's occupation would be gone. Now, all gluttons, biped or quadruped, are great drinkers, whether of pure water or "fire water," in its very varied poisonous forms; and the moles have a very ingenious method of procuring and preserving water, without

which, I am convinced, no mole could live twenty-four hours. M. La Court, a distinguished French naturalist, who made moles and their habits a special study, declared that they even dig deep wells for water in their underground "mansions," and preserve it against droughts. By the way, that writer's description of these mansions," or "fortresses," as he terms them, is peculiarly interesting, and I append a translation of what he wrote:—

Each individual appropriates to himself a district, or space of ground, in which he forms a kind of fortress under a hillock in some secure place, as beneath a bank or near the roots of a tree. In this eminence, of which the earth is rendered very compact, is formed a circular gallery, communicating with a smaller gallery, placed above it, by several passages. On the level of the lower or larger gallery is a roundish cavity or chamber, communicating with the upper three passages. From the outer gallery branch off a number of passages, which run out to a variable extent, and, forming an irregular curve, terminate in what may be called the high road, which is a long passage proceeding from the outer circular gallery, and at the same time communicating directly with the central cavity. It extends to the farthest limit of the domain, is of somewhat greater diameter than the body of the animal, has its walls comparatively compact, and communicates with the numerous passages by which the domain is intersected. By this principal passage the mole visits the various parts of its hunting-ground, burrowing on either side, and throwing out the earth here and there, so as to form heaps or mole-hills. As it traverses this path several times daily, it is in it that snares are laid for its capture. The excavations vary in their distance from the surface, according to the nature of the soil and other circumstances. In deep, rich earth they are sometimes nearly a foot in depth, while in gravelly or clayey ground, covered with a thin layer of soil, they are often scarcely an inch. Often also the mole burrows quite close to the surface of rich, loose soil which has been ploughed, and sometimes runs along it, forming merely a groove or trench.

The Mole and Water Mystery.

This theory of the mole as a confirmed teetotal tippler is held indisputable by all competent naturalists, and it is as true of the American variety as our familiar friend, the *Talpa europaia*, of this country. They have this in common also, that all varieties of moles are expert swimmers, take to the water freely, and have been known to swim nearly 100 yards. In 1890, however, a rude shock was given to the theory by no less an authority than Mr. W. H. Hudson, the very distinguished naturalist. In a charming book, "Nature in Downland" (Longmans, Green, and Co.), he gave a description of his rambles over the Sussex Downs, and he therein stated (pp. 77-80) that in that part of the country moles subsisted for several months of the year without water, for they could not obtain it, dig down ever so deep. I know many large tracts of these downs, and am fairly (for a non-expert) familiar with the geology of the land. That surface water or water close to the surface is sadly lacking, and, in fact, totally absent, in the summer and early autumn months, is true. But is it not possible that Mr. Hudson did not get down to "the bottom facts," as it were, of the subterranean mole supply? I think so; at least that is a more feasible theory than the alternative one, that the moles of the Sussex Downs have through many ages become acclimatised to the almost total want of water.

Practical Usefulness of Moles.

When I was employed as a boy on a farm in Ayrshire, one of my duties in spring time was to scatter the "mole-hills," especially on the rather poor lea-land. My "master," who, in many respects was an agriculturist far in advance of his age, would not permit professional or amateur mole-catchers to destroy these animals, believing, as he did, that they worked for good in

loosening the subsoil, while the fine mould thrown up formed an admirable kind of top-dressing. Neither can I for my own part see what injury moles can do in forests. At all events, I am very familiar with many of the best German books on sylviculture, and I cannot recall to mind, not even in Professor Hess's great "Der Forstschutz," any information as to the protection of trees from the "ravages" of moles, such as in the case of rabbits, squirrels, voles, mice, hares, &c. Of course, in a highly cultivated garden I could understand moles becoming worse than a nuisance, but not otherwise; therefore, my advice is: *Don't* exterminate moles.

THE WORLD'S RUBBER SUPPLY.

From the trade returns published by Messrs. W. J. and H. Thompson, brokers, of Mincing lane, London, we obtain the following particulars concerning the visible rubber supply on 1st August, 1907:—

	1907.		1906.	Excluding Continental Stock. 1905.	1904.
	Para.	Caucho.			
Stock in England, 1st hand ...	514	...	587	226	240
Ditto 2nd hand ...	177	...	190	163	195
Stock of Caucho in England ...	...	635	313	218	323
Stock in Para, 1st hand ...	30	...	40	20	20
Ditto 2nd hand ...	220	20	380	260	280
Stock in America	460	70	490	655	170
Stock on Continent	100	50	440	90	175
Afloat to Europe	410	100	470	650	320
Afloat to America	100	...	200	100	220
	2,011	875			
Total	2,886		3,110	2,382	1,943

The world's visible supply on 1st August, 1907, shows a decrease of 224 tons against 1st August, 1906. The stock in U.S.A. on 1st August, 1907, shows an increase of 40 tons against 1st August, 1906. The stock in England on 1st August, 1907, shows an increase of 236 tons against 1st August, 1906; and the stock in Para on 1st August, 1907, shows a decrease of 150 tons against 1st August, 1906.

The receipts at Para for July, 1907, show a decrease of 470 tons against July, 1906, and are 1,370 tons this year against 1,840 tons last year.

VALUATION OF COFFEE.

In the London market, valuation of coffee is now done chiefly by the liquor test. A buyer of coffee in London supplied the information below to the "Ceylon Tropical Agriculturist":—"The weight of coffee means quality, practically always. Where a sample runs 90 roasted beans to the ½-oz., it is generally good. The home trade is mostly done by 'liquor,' and to some buyers it matters very little what the appearance of the coffee is. A good-looking coffee often liquors well, but not necessarily so. Foxiness is not a bar to good liquoring quality. Peaberry has a better flavour than other sizes, probably because the nourishment of what was prepared by Nature for two beans has gone into one. There is very little liquoring difference between A, B, and C, and it is sometimes found that B and C liquor better than A. To test roasted coffee, put ½-oz. of powder to ½-pint of boiling water. The fluid is tasted as soon as cool enough, and when nearly cold. The best flavour is obtained when nearly cold."

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

Twentieth Lesson.

Food Requirements of Man. Mixed Diet. Daily Waste and Average Supply by Diet. Process of Digestion. Preparation of Food. Cooking and its Objects. Condiments. Water as a Food. Bread Baking. Health and Cleanliness.

In our last lesson we studied the functions of food in general and the food rations required by farm animals in particular. We will now look into the **food requirements of the human being.**

The animal, in the choosing of its foods, is entirely guided by instinct, and rarely commits mistakes which may cause ill-effects. Due to civilisation, the natural instincts of the human being with regard to its food requirements have become more or less stunted; still, even now, in the mixing of our foods—eating cheese with bread, milk with rice and sago, salt fish with egg sauce, peas and beans with bacon, potatoes and other vegetables with meat—our habits are instinctive. The **amount and kind of food required** by a human being must necessarily depend on many conditions, as age, temperament, health, work, climatic conditions, &c., and consequently the diet for the young and old, for the healthy and the sick, man at rest and at work, must be different. The human being is unquestionably fitted by Nature for the digestion of both **animal** and **vegetable foods,** and a combination of the two is generally considered healthier and more economical than an exclusive flesh diet or a pure vegetable diet. We have a natural longing for a variety of food, and we should be guided by this instinct for a **mixed diet.**

It cannot be denied that a pure vegetable diet could supply us with all the nutrients required, but as a rule these nutrients are not so easily assimilated, and leave a much larger amount of undigestible refuse than an equivalent amount of animal food. A flesh diet, on the other hand, appears to be more stimulating, produces more courage and strength, and gives greater working energy, but is undoubtedly more harmful if taken in excess. Excess of food is the cause of a great amount of illness and disease. Such an excessive intake of food, more particularly of animal food, is of greater danger to middle-aged and aged people than to the young, and more so to people with sedentary habits than to the heavy worker, causing accumulation of fat; a continual over-stimulation; too great an accumulation of waste products, which means a heavy strain and increased work for the organs of digestion and excretion, and leads to indigestion, bilious attacks, headaches, gout, and many other diseases.

The effects of taking too little food are general wasting and weakness, increased liability to disease, and decrease of resistance power.

The factor of diet in the curing of a great variety of disease, although known for ages, has only of late been thoroughly studied and applied. Experiments carried out quite recently have also shown that our older dietary scales are rather in excess of requirements, leading to unnecessary waste, which would be largely avoided if all foods would be more thoroughly masticated. It is only common sense to recognise that the better the food is chewed the finer will be all particles and the more intimate will be the mixture with saliva, the easier

will be the digestion, and the greater will be the amount of nutrients assimilated. A large amount of soft pappy foods given to children leads to the bad habit of bolting food without chewing; the teeth do not get a sufficient amount of exercise, and as a consequence degenerate, and at the same time not sufficient saliva is excreted during the eating.

We have already learned that in every living organism a continual wear and tear takes place, and in order to make good this loss a sufficient amount of carbonaceous and nitrogenous food must be consumed. **The quantity of waste products** which are given off by the lungs, the skin, the kidneys, will be a guide for the estimation of the necessary food supply. On an average an adult requires about 300 grains of nitrogen and 4,800 grains of carbon daily. Dr. Lethebridge states the requirements of a diet to be as follow:—

	Grains of Nitrogen.	Grains of Carbon.
For idleness	180	3,816
For ordinary work	307	5,688
For hard work	391	6,823

We remember, from previous lessons, that the principal cause of waste in any living body is the continual process of **slow combustion** or oxidation, and the oxygen necessary for this internal fire is supplied by the act of breathing, so that air must be considered as an important part of our daily food. The amount of oxygen required is about $1\frac{3}{4}$ lb. or 18·3 cubic feet daily, when at rest; and, in order to supply this, from 400 to 800 cubic feet of fresh air are necessary. At the same time, as the air exhaled contains a large amount of carbonic acid gas, the surrounding air is continually vitiated, and for this reason plenty of room and a good ventilation has to be provided, so that every person is supplied with about 3,000 cubic feet of fresh air per hour. According to Professor A. H. Church, the following table shows the **daily waste** of an adult in good health, weighing on an average 154 lb. and measuring 5 feet 8 inches in height:—

DAILY WASTE, in Ounces.

OXYGEN in carbonic acid gas given out by the lungs	13·74	
Do. do. do. skin	·25	
Do. in organic matter secreted by kidneys and intestines ...	·82	
Do. in the water formed in the body	9·30	
Total OXYGEN in waste	...	34·11
CARBON in CO_2 given out by the lungs	8·73	
Do. do. skin	·09	
Do. in organic matter secreted by kidneys	·39	
Do. do. do. intestines	·70	
Total CARBON in waste	...	9·91
HYDROGEN in the water formed in body and given out by lungs and skin	1·16	
HYDROGEN in the organic compounds secreted by kidneys and intestines	·23	
Total HYDROGEN in water formed and in waste ...	...	1·39
NITROGEN in urea and other waste of kidneys	·56	
Do. in waste given out by the intestines	·11	
Total NITROGEN in waste	...	·67
COMMON SALT given out by the skin	·02	
Do. do. do. kidneys	·72	
Total SALT in waste	...	·74
PHOSPHATES and POTASH SALTS given out by the kidneys (chiefly)	...	·39
WATER taken in as such, and given out by the lungs, skin, kidneys, and intestines in addition to that found in the body	...	88·73
Total daily waste		135·94
Or about		$8\frac{1}{2}$ lb.

This considerable amount of daily waste has to be made up by a daily supply, as follows:—

DAILY SUPPLY, in Ounces.

OXYGEN taken from the air breathed	26·26	
Do. in starch, albuminoids, and fat	7·85	
Total OXYGEN		34·11
CARBON in fat, starch, albuminoids		9·91
HYDROGEN in same		1·39
NITROGEN in albuminoids		·67
COMMON SALT		·74
PHOSPHATES, POTASH, SALTS, ETC.		·39
WATER		88·73
Total		135·94

This waste is made up by the necessary food containing in the

AVERAGE DAILY DIET for an Adult,

	In 100 Parts.	Each 24 Hours. In Ounces.
Water	81·5	88·73
Proteins	3·9	4·25
Starch and sugars	10·6	11·40
Fat	3·0	3·77
Common salt	·7	·74
Phosphates, potash, salts, &c.	·3	·39

These amounts of nutrients could be supplied by the following DAILY RATION:—

Bread	18 oz.	Cabbage	6 oz.
Butter	1 oz.	Cheese	3½ oz.
Milk	4 oz.	Sugar	1 oz.
Bacon	2 oz.	Salt	¾ oz.
Potatoes	8 oz.	Water (3⅓ pints)	66¼ oz.

This ration contains about 290 grains of nitrogen and about 4,700 grains of carbon. The amounts of nitrogen and carbon necessary to be supplied daily to an adult are about 300 and 4,800 grains, and they are contained in the following weights of the different principal foodstuffs:—

	300 Grains of NITROGEN Contained in—	4,800 Grains of CARBON Contained in—
Cheese	10 oz.	2 lb. 7 oz.
Peas	1 lb. 3½ oz.	1 lb. 14¾ oz.
Lean meat	1 lb. 4¼ oz.	5 lb. 7¾ oz.
Wheaten flour	1 lb. 14 oz.	1 lb. 11½ oz.
Eggs	2 lb. 2 oz. = 19 eggs	4 lb. 10¾ oz. = 41 eggs
Black bread	2 lb. 5¼ oz.	2 lb. 13 oz.
Rice	4 lb. 6¼ oz.	1 lb. 14 oz.
Cream	6 lb. 3½ oz. = 5 pints	2 lb. 15¼ oz. = 2½ pints
Milk	6 lb. 13¾ oz. = 5½ pints	9 lb. 12 oz. = 7½ pints
Potatoes	10 lb. 12 oz.	6 lb. 8½ oz.
Bacon	11 lb. 4 oz.	15 oz.
Cabbage	17 lb. 14 oz.	19 lb. 8 oz.
Beer	40 lb. = 32 pints	27 lb. 9 oz. = 22 pints

This table is well worth a careful study, as it shows us the comparative food value of the different foodstuffs, and teaches us how to choose our foods so as not to starve in the midst of plenty, as a food not containing a sufficient amount of nitrogen must be mixed with one containing more. Take, for instance, bacon, of which a very small amount is required to supply the necessary amount of carbon in the form of fat, but which, however, supplies hardly any nitrogen, and for this reason we eat eggs with bacon, as they contain a fair amount of nitrogenous constituents. Cheese, again, is a highly nitrogenous

food, and is used in connection with bread and butter, which are richer in carbon.

The **process of digestion** of foods, the absorption and transfer of the nutrients into the blood, is a very complex one, which we have already touched on in some of our previous lessons, and which we now will recapitulate in a concise manner.

The food, prepared by cooking, is thoroughly **masticated** by the aid of our teeth, and at the same time is intimately mixed with **saliva**, which is secreted during mastication by the salivary glands. During mastication the food is also warmed up to blood heat, and, by the action of the active ferment **ptyalin** of saliva, the broken-up but still **insoluble starch grains** are changed into a **soluble form of sugar.** No food should be swallowed until completely masticated and thoroughly mixed with saliva into the form of a soft bolus, which then passes through the gullet into the stomach. Already during the process of mastication quantities of **gastric juice** have been excreted by the gastric glands of the stomach, which acid digestive fluid acts on the food, and changes the proteins of the food into a new substance, a soluble **peptone**, which is not coagulated by heat and which easily passes through animal membranes. The gastric juice does not act on the fat and starch. During the time of digestion in the stomach the mucuous lining absorbs and passes into circulation the mineral salts contained in the food, large proportion of the water, the soluble peptones, the sugar contained in the food, and also the sugars produced by the hydrolysis of starch during mastication. The food is retained in the stomach from one to four hours, according to its digestibility. The food now, in a semi-fluid form called **chyme** (see 17th lesson), passes through the opening of the pyloric valve into the small intestines. The chyme, which is distinctly acid, is changed by the intestinal digestion into chyle, which is of much thicker consistency and nearly white. The strongly alkaline secretion of the liver—the **bile**—neutralises the acidity of the chyme, and thereby enables the **pancreatic juice** to digest the remainder of the starch, by a change into sugars, to digest also the protein, and, furthermore, help in the digestion of fats. The digested nutrients of the chyle are absorbed during the passage through the small intestines; the undigested portions pass into the large intestine, from which they are ultimately discharged in the form of fæces.

Most of the foods used by man are prepared by a **process of cooking,** and hardly sufficient attention can be paid to the art of cooking, as many disorders and diseases can be attributed to badly cooked and ill-assorted foods.

The **objects of cooking** are the following:—

1. The food is softened and partially broken up, which makes mastication easier and aids digestion.
2. The foods are made more palatable, by being made pleasant to the eye and to the taste.
3. Certain chemical changes take place during cooking, which also aid digestion; fibre and connective tissue is changed into gelatine, starch into sugars, &c.
4. Various foods can be combined in proper proportions, in order to get a higher nutritious value and proper nutritive ratio.
5. The foods are warmed, and therefore economise food, as digestion can only take place when the food reaches the temperature of blood heat.
6. Unnecessary and frequently very indigestible portions of foods are removed, as, for instance, the skin of potatoes, bran from the flour, seeds from fruit, &c.
7. Any parasites and bacteria present in the raw foods are destroyed, noxious organic compounds are dissipated, decomposed, and rendered harmless, and thus the cause of many diseases completely removed.

The chief factor in the process of cooking is heat, and according to the desired results different degrees of heat are necessary.

The temperature required for—

Stewing and simmering, from	165° to 180° F.
Boiling water	212° F.
Increased by addition of salt to about	216° to 218° F.
Frying heat	365° F.
Heat of a slow oven	200° to 250° F.
Moderately hot oven	300°
Hot oven	400°
Very hot oven	480°
Boiling fat and oil	600° to 700° F.

The different processes or **modes of cooking** are :—*Roasting*, *Baking*, *Grilling or Broiling*, *Frying*, *Steaming*, *Boiling*, *Stewing*, and *Soup-making*.

In the first six methods the juice in the inside of the meat is retained, as the albumen in the outside layer is coagulated at once by the heat, and forms a protective crust. After this crust has once formed by the heat of quick-roasting, grilling, or boiling, a lesser heat is required to finish the cooking.

In stewing, which is perhaps the most economical mode of cooking, and also in soup-making, the meat is put on with cold water, and most of the nutritious substances are dissolved in the gravy or in the soup; at the same time, cheaper cuts of meat can be utilised; vegetables are also incorporated; less heat and, therefore, less fuel is required; and the products are tender and easily digested.

Vegetables and **fruits** form a very necessary part of the human foods, more particularly in summer time, as they contain fairly large amounts of mineral and organic salts, organic acids, and other compounds which help to purify the blood. All green vegetables are, after thorough cleaning, put into boiling water containing a necessary amount of salt; if the water is at all hard, the addition of a small amount of soda will be found very effectual to help to soften the vegetables on boiling.

Potatoes are most economically boiled in their skin, as the most nitrogenous part is nearest to the skin, and would be lost when potatoes are peeled before boiling; they are put on with cold water. Dry beans and peas, and also oatmeal for the making of porridge, should be soaked in water over night; they are not only rendered softer and easier digestible, but their nutritive value is increased.

The action of heat is even more important in the cooking of vegetables than in the cooking of meat, as many vegetables are quite useless in a raw state as a human food, whereas meat can be eaten and digested in a raw state. The fibre of the vegetables is softened and broken up by boiling; the starch grains swell up and burst, and are transformed in such a condition as to be easily attacked by the digestive fluids. Many harmful compounds are also decomposed by boiling—for instance, potatoes contain a small amount of poisonous alkaloid—solanin—which is decomposed by the boiling water.

In cooking, frequently small amounts of **condiments** are added, with the purpose of making foods more palatable, helping in the digestion, and to stimulate the digestive organs. With the exception of salt, condiments should not be used in any quantity by children.

Common salt, sodium chloride, is not only necessary for the flavouring of our foods, but is absolutely necessary for our existence. Salt increases the flow of saliva, and is necessary for the production of the hydrochloric acid in the gastric juice. About 200 grains of salt are required daily by an adult. Other important condiments are the organic acids. One of the most common is

cetic acid, the acid contained in **vinegar.** Vinegar is the product of acetuous fermentation of alcoholic liquids, which is caused by the activity of a small vegetable growth—mother of vinegar, *Mycoderma aceti*—which takes oxygen from the air, and then gives it up in oxidising alcohol to acetic acid (see 15th lesson). Acetic acid is also made by the destructive distillation of wood, which produces wood spirit, acetic acid, and tarry matters. This acetic acid is called wood vinegar or pyroligneous acid.

Other organic acids used as foods are **citric acid,** contained in lemons and limes, and **tartaric acid,** found in grapes.

The peculiar sharp taste and pungent odour of mustard and horse-radish are due to a volatile acrid oil. The characteristic constituents of pepper and many other condiments are also volatile oils.

A very considerable amount of **water** has to be supplied as food, and therefore must be considered as one of the most important of mineral foods. A certain amount is supplied with the foods we eat, and the rest has to be taken as a drink. Water aids as a solvent in digestion, as in form of watery solutions the different nutrients taken from the digested foods are transported to the different parts of the body, and again water assists in the removal of the waste products. By a slow evaporation the water helps in the regulation of the temperature of the body. During meals little or no drink should be used, as the digestive fluids would be too much diluted and digestion impaired. Particularly harmful are iced drinks, which stop digestion altogether until the contents of the stomach have again reached blood heat. The best time for taking the necessary amount of water is about one hour before meals and from three to four hours after meals. Our ordinary beverages, **tea** and **coffee,** have practically no value as foodstuffs, but have a stimulating effect, due to the small amount of alkaloid they contain. **Cocoa** has a similar stimulating effect, but is at the same time a very nutritious food. One of our most important beverages is **milk,** which contains all the important necessary constituents of a complete food in the proper proportion. It is the natural food of the young, and does not require a preparation by cooking. In order to make milk keep and prevent it from turning sour, it is generally boiled; but it must be understood that boiled milk is not so digestible as fresh milk, particularly to infants. Human milk contains less nitrogenous matter (casein) and rather more milk-sugar than cows' milk, and for this reason: when cows' milk has to be used as a food for small infants it is usual to add to each pint of cow's milk about 10 oz. of water and 1 oz. of sugar. In many cities, in this manner, humanised cows' milk is made up and sold in sterilised closed bottles, each containing a sufficient quantity for one meal. All the products made from milk, as cream, **butter, cheese,** curd, and whey, are of great importance as food materials for the human beings.

Another complete animal food are **eggs,** but as they contain no carbohydrates they are not such a perfect food as milk. Although highly nutritious, they are not so easily digested as milk, and could not be used as a substitute for milk as a food for children. A lightly-boiled egg is much more easily digested than hard-boiled or even a raw egg; in the form of poached eggs and scrambled eggs they are also in a fairly digestible form, but fried eggs are rather indigestible. Boiling eggs, in such a manner that they remain soft, still are cooked right through, is best accomplished by putting the eggs into boiling water contained in a fair-sized saucepan, then taking the saucepan immediately off the fire, and to remove the eggs from the water after standing about five minutes. By boiling the eggs from $2\frac{1}{2}$ to 3 minutes, as usually done, the white of the egg gets too hard, whereas the yolk remains raw in the centre. The egg may also be put on with cold water, and removed as soon as the water boils properly.

Of vegetable foods, the **grains of cereals** are the most generally useful, and are used all over the world as **breadstuffs.** Of grains, again, **wheat** is the most

important one, as it may be successfully grown in almost any locality. A preparation of the grains before being fit as a food is absolutely necessary. The seeds are broken up by grinding or milling, and the coarse, indigestible particles of fibre removed by sieving. The flour itself in its raw state could hardly be digested, and it has to be further prepared by cooking, being either boiled or baked. By the action of heat the cells containing the starch are broken up; the starch grains themselves are changed into a pasty condition, in which form starch is easily attacked by the digesting fluids. When flour is mixed with water a tough **dough** is formed, in which process the **gluten,** the principal protein of flour, plays an important part. Different flours are able to take up more or less water, and the baker speaks of **strong flours** as such which take up a large amount of water to produce a dough of certain consistency. The **strength of flour** is not entirely depending on the amount of gluten, but rather on the composition and proportion of the various proteins and several other factors, and the strength is not by any means an indication of the food value of a flour.

If a dough, a simple mixture of flour and water, is baked without further treatment it forms a hard cake, something like biscuits. To produce **bread,** the dough has to be mixed with **yeast,** which consists of microscopic cells, which change sugars into alcohol, developing at the same time carbonic acid gas, which by the working is diffused evenly right through the mass of the dough. On heating the small bubbles expand, and give the bread the spongy appearance. The heat, at the same time, kills all yeast cells, prevents further action, and also breaks up starch grains, and acts on the proteins, coagulating them, so that the loaf after cooling keeps its shape. Instead of using fresh yeast or barm with each batch of bread, some of the sour, fermented dough—**leaven**—from a previous batch may be mixed with the dough. However prepared, the dough must be allowed to **"rise"** by being kept for a few hours at a temperature of 80 to 85 degs., which is most suitable for the growth of the yeast cells, until the loaves are about double their original size. They are then put into an oven heated to a temperature of about 400 degs., which temperature is allowed to gradually sink to about 300 degs. The use of yeast is avoided in machine-made or **aerated bread,** in which the flour is kneaded in a closed iron trough, with water saturated with carbonic acid gas under pressure (like in a soda-water bottle). As soon as the dough is taken out of the kneading-trough the gas bubbles must expand and swell the loaves up. The rising of the bread, cakes, and pastry may also be accomplished by the use of **baking powders** or of self-raising flour, which is simply a flour containing a certain amount of baking powder. In baking powders carbonic acid gas is produced by the action of a weak organic acid, generally tartaric acid, on bicarbonate of soda (baking soda). Instead of the acid itself, frequently the acid salt, cream of tartar (see 15th lesson) is used. The following are a few recipes for the preparation of BAKING POWDERS:—

1. Tartaric acid powder ...	... 8 oz.	3. Cream of tartar ...	... 8 oz.
Bicarbonate of soda ...	... 9 oz.	Tartaric acid powder ...	... ½ oz.
Rice flour	... 10 oz.	Bicarbonate of soda ...	... 6 oz.
2. Cream of tartar ...	... 9 oz.	Carbonate of ammonia	... 8 oz.
Bicarbonate of soda ...	... 4 oz.	Rice flour or corn flour	... 8 oz.
Rice flour or corn flour	... 7 oz.		

In all these recipes the finely powdered ingredients must be thoroughly mixed, and the powder kept in closed tins, for use. Take about 1 teaspoonful for every 1 lb. flour.

SELF-RAISING FLOUR.

25 lb. flour, 6 oz. soda, 11 oz. cream of tartar, 3 oz. sugar, and 3 oz. salt are carefully mixed. (See 5th lesson.)

Carbonate of ammonia (salts of hartshorn) is also used for the artificial production of CO_2 gas, more particularly in the manufacture of biscuits.

Having devoted such a lengthy chapter to foods and cooking, we must, in conclusion, not overlook another important factor of health—**cleanliness**—the necessity of which is quite evident if we bear in mind the importance of ferments, moulds, and bacteria, which we briefly studied in our 16th lesson, and for which dirt is the favourite breeding-ground. Disease and dirt are always closely connected, and therefore scrupulous cleanliness should exist in every household. **Sunlight** and **fresh air** are the simplest disinfectants, and plenty of **hot water** and **soap** are of the greatest value for the removal of dirt and grease.

All cooking utensils must be carefully cleaned after use; sinks, drainage pipes, and other utensils should be from time to time disinfected with Condy's fluid, solutions of carbolic acid, lysol, kerol, izal, or any other germicides. All clothing should, as far as material allows, be boiled, and the addition of a small amount of ammonia and of kerosene to the boiler containing soapy water will greatly facilitate the operation of washing.

All waste scraps of fat—tallow—should be kept as a very good **scouring soap** for household purposes, and can be made in the following manner:—

Dissolve 1 lb. caustic soda (98 per cent.) in 3½ pints of water; stir until dissolved and allow to cool. Now take 7½ lb. grease or tallow, melt it, allow to cool, and pour the cold soda lye in a small stream into the fat; keep stirring with a broad wooden stirrer until the whole have combined and the mixture looks like honey. It generally takes from 15 to 20 minutes; then pour mixture into a wooden box. The grease must not contain any salt.

Rooms may be easily disinfected by burning sulphur in an old iron pan, and leaving the room closed for about twenty-four hours. The surest way to destroy all vermin, cockroaches, moths, bugs, &c., is by fumigating the room with hydrocyanic acid gas, but as this gas is very poisonous the operation should only be conducted by an experienced person.

QUESTIONS TO THE TWENTIETH LESSON.

1. Why is a mixed diet most suitable for man?
2. In what forms are carbon and nitrogen given off as waste products?
3. What nutrients are digested by the aid of (*a*) saliva, (*b*) gastric juice, (*c*) pancreatic juice and bile?
4. What are the objects of cooking?
5. Which are the principal modes of cooking?
6. Why is the preparation by cooking more necessary for vegetable foods than for flesh foods?
7. What are the objects of using condiments?
8. Which condiment is an absolute necessity?
9. Why is milk an ideal food for the young?
10. In what form are eggs most easily digested?
11. What changes take place in a dough on baking?
12. What is the object in using yeast and baking powders?
13. Why is cleanliness an important factor in health?
14. Why does a habitual excess in eating cause disease?

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.			1907.									
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.
North.													
Bowen	1·76	0·99	11·01	2·53	3·74	1·97	0·39	3·46	2·87	Nil	1·28	0·51	0·06
Cairns	0·56	13·26	11·31	18·36	11·49	3·26	3·35	8·65	4·45	0·12	0·39	1·35	0·68
Geraldton	2·28	21·08	21·20	29·58	25·26	4·58	6·08	21·91	8·54	2·39	4 66	1·36	1·42
Herberton	0·30	5·16	10·82	10·56	11·77	2·05	0·90	1·57	2·71	Nil	0·11	0·12	0·17
Hughenden	0·61	0·51	4·76	1·98	3·83	1·17	0·16	1·34	0·95	1·16	Nil	Nil	1·66
Kamerunga State Nurs.	0·72	10·00	8·17	15·78	14·82	4·87	2·80	9·33	5·29	0·13	1·15	1·19	0·53
Longreach	2·16	0·66	0·51	1·22	0·49	1·88	0·85	0·93	0·40	0·49	0·04	Nil	1·08
Lucinda	1·85	6·60	*22·36	12·38	23·82	4·53	3·92	19·29	6·34	0·29	1·05	1·19	0·25
Mackay	2·63	1·80	12·93	2·72	6·42	8·01	1·58	*6·09	5·04	0·27	0·25	0·12	0·12
Rockhampton	1·07	0·46	5·19	4·15	4·42	3·05	0·44	0·94	4·16	0·84	0·47	Nil	0·47
Townsville	1·45	7·74	14·03	12·49	7·75	7·37	1·03	3·11	2·38	Nil	0·07	0·14	0·03
South.													
Barcaldine	2·92	1·33	1·04	3·44	0·43	1·51	0·82	0·34	2·03	0·87	0·06	Nil	1·21
Beenleigh	2·94	1·75	3·98	4·75	3·88	4·17	0·58	4·70	4·92	0·71	0·58	Nil	1·73
Biggenden State Farm	1·19	3·09	4·55	5·77	3·55	10·91	0·34	4·02	5·24	1·51	0·96	0·24	1·99
Blackall	5·86	1·37	1·96	2·30	Nil	2·78	1·69	0·20	0·36	1·36	0·06	Nil	0·88
Brisbane	3·81	1·07	3·28	2·69	5·23	5·32	0·45	4·75	2·91	0·39	0·79	0·10	1·37
Bundaberg	1·57	0·97	3·85	3·29	3·90	12·81	0·38	3·08	4·49	0·87	0·43	Nil	1·70
Caboolture	4·73	4·26	3·15	2·53	8·03	9·04	0·78	3·10	4·98	0·73	0·32	0·13	2·09
Charleville	2·66	1·30	3·71	0·85	Nil	2·75	2·29	0·26	0·90	1·04	0·76	0·02	1·69
Dalby	2·96	2·12	5·67	5·60	1·34	3·72	0·20	2·26	2·35	0·87	0·71	0·15	0·69
Emerald	1·55	2·32	1·79	7·36	3·67	7·66	Nil	Nil	2·53	1·75	0·10	Nil	0·98
Esk	2·90	2·45	5·26	2·87	6·79	3·60	0·22	5·42	2·66	0·54	0·81	0·57	0·50
Gatton Agric. College	2·25	2·01	3·45	2·62	6·44	2·71	Nil	2·80	1·85	0·54	0·56	0·15	0·71
Gayndah	2·25	4·25	2·82	3·00	1·91	6·89	Nil	2·65	3·00	1·21	0·53	0·40	0·34
Gindie State Farm ...	3·20	2·95	1·45	6·13	0·71	10·10	Nil	Nil	2·29	1·58	0·10	0·16	0·61
Goondiwindi	2·36	2·32	4·04	5·37	1·77	6·51	0·33	1·30	1·09	1·62	0·95	0·12	1·13
Gympie	3·03	4·12	5·32	3·99	6·96	8·93	1·12	3·84	3·77	0·80	0·17	0·47	1·20
Ipswich	2·60	0·71	4·22	2·17	5·38	1·95	0·12	3·43	2·22	0·30	0·43	0·05	0·78
Laidley	2·87	1·78	4·12	2·84	4·50	3·47	Nil	2·99	1·56	0·45	0·58	0·15	0·87
Maryborough	1·22	2·49	4·39	5·52	7·84	10·28	1·25	3·21	6·05	0·64	0·93	0·25	2·74
Nambour	4·89	3·40	6·74	5·74	12·05	13·30	1·36	4·54	6·96	1·08	1·13	0·60	1·38
Nerang	8·26	2·75	6·33	9·86	6·04	7·83	1·48	7·54	5·08	1·26	1·35	0·05	0·86
Roma	2·37	1·32	4·31	6·32	2·92	1·87	0·42	0·27	2·47	1·03	0·42	0·04	1·04
Stanthorpe	2·90	2·49	4·89	4·33	3·30	5·98	1·68	1·79	2·44	1·06	1·65	0·13	1·30
Tambo	2·85	1·23	1·16	4·74	1·41	3·58	3·69	0·11	0·89	1·42	0·09	Nil	0·68
Taroom	1·70	1·35	5·49	5·16	1·10	1·86	Nil	1·01	3·76	0·70	0·04	0·10	0·67
Tewantin	4·38	2·73	9·53	6·38	15·83	11·45	1·87	7·16	7·61	1·48	0·95	0·55	1·05
Texas	3·42	2·23	1·83	4·69	4·55	6·16	0·65	0·93	1·62	1·31	0·87	0·07	1·83
Toowoomba	2·76	2·65	4·11	3·94	4·00	4·81	0·01	4·61	3·34	0·91	0·65	0·17	1·58
Warwick	2·47	2·99	5·50	3·95	2·52	5·71	0·51	1·58	1·27	1·16	1·37	0·01	1·37
Westbrook	3·41	1·79	1·48	1·79	2·91	5·13	0·02	2·53	2·53	1·04	1·78	Nil	1·08

* Compiled from telegraphic reports.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

FEDERAL BOUNTIES.

Under the Federal Bounties Bill recently passed in the Federal Parliament the following is the schedule of bounties:—

For cotton, ginned, for eight years from 1st July, 1907, at 10 per cent. on market value; maximum amount in one year, £6,000.

Fibres.—New Zealand flax, for ten years, at 10 per cent., £3,000.

Flax and hemp, for five years, 10 per cent., £8,000.

Jute, for five years, 20 per cent., £9,000.

Sisal hemp, for ten years, 10 per cent., £3,000.

Mohair, for ten years, 10 per cent., £2,000.

Oil materials supplied to an oil factory.—Copra, fifteen years, 15 per cent., £5,000.

Cotton seed, for eight years, 10 per cent., £5,000.

Linseed (flax seed), for five years, 10 per cent., £1,000.

Rice, uncleaned, for five years, £1 per ton, £1,000.

Rubber, for fifteen years, 10 per cent., £2,000.

Coffee, raw, for eight years, 1d. per lb., £1,500.

Tobacco leaf for the manufacture of cigars, high grade, for five years, 2d. per lb., £4,000.

Fish, preserved, for five years, ½d. per lb., £10,000.

Dates, for fifteen years, 1d. per lb., £1,000.

Dried fruits (except currants and raisins), or candied, and exported, for five years, 10 per cent. on market value, £6,000.

Combed wools or tops, exported for two years, commencing from 1st July, 1908, 1½d. per lb.; for three years thereafter, 1d. per lb. Total, £10,000.

These bounties will doubtless to a considerable extent induce farmers in the tropical and sub-tropical portions of the State to enter more largely into the cultivation of sisal hemp, coffee, cotton, rice, rubber, and dates. Flax, also, which thrives so well on the Darling Downs, should now, in view of the 10 per cent. bonus on linseed, be largely grown. The sisal planter will realise between £3 and £4 per ton more on the fibre, and 10 per cent. on ginned cotton and on cotton seed should enable the buyer of seed cotton to pay the farmer a much higher price for that article than the 1½d. per lb. now paid. £1 per ton bonus on rice should start the Pimpama and Cairns rice-growers into renewed activity.

ANTI-SELENITA.

The American consul at Monterey, Mexico, says that a new fluid is being manufactured in that city for removing, and also for preventing, scale in boilers, and the preparation is very successful in this direction. In his report, he says:—"It is said to effectually remove scale from boiler tubes, and that it works no injury to the tubes nor to the boiler shell. The compound has been introduced into various countries in America and Europe. It is manufactured wholly from vegetable substances from plants found in Mexico, and is developing into a large local industry. It has come into almost universal use in this country with all industries that use steam boilers; yet the greater portion of the product of the factory goes to the United States and Canada, where boiler users seem to find it a successful solvent and preventive of calcareous scale in boilers."

Plate XXXII.

1. Pipe Made from Seed Capsule of Eucalyptus mineata.
2. Pipe Made from the Calabash Gourd.

THE ORANGE-WRAPPING MACHINE.

We have already made reference to this machine in previous issues of the Journal, and some particulars concerning it have now reached us through the medium of the "Journal d'Agriculture Tropicale," which we give here:—The machine receives the oranges from the mouth of the grader, on an endless chain furnished with sockets of felt and rubber. The packing-paper is taken automatically from a roller, is printed, cut to the required size, and rolled round the fruit. The latter is held between a fixed cushion lined with felt, and a rubber piston, whilst by a single operation the paper is twisted, enclosing the orange completely. This process results in a considerable economy of paper over the usual wrapping by hand—about 20 per cent. Furthermore, the need for stocks of paper, all cut to different sizes, is avoided, as the machine can be regulated for all sizes of oranges. Its action is so gentle that it has been used for wrapping eggs without breaking the shell. The machine wraps 72 oranges a minute—equal to 40,000 in 10 hours—and the wrapping thus accomplished is perfectly airtight.

SHIPMENTS OF LIVE FISH.

It has long been known that many kinds of fish can live for some time out of water, provided their gills remain wet, and, bearing this fact in mind, experiments have recently been carried out in Germany with a view to devising a cheap method of transportation for live fish. The results are stated by the American consul at Frankfort to have been very satisfactory.

The gills in the fish have the same function as the lungs in the human being, and are the organs by means of which aeration of the blood is brought about, the difference being, of course, that the fish can only obtain the necessary oxygen when the latter is dissolved in water, and cannot take it direct from the air.

The aim of the experiments referred to was to keep the gills wet, and to see that the moisture was well charged with oxygen. The fish were accordingly placed in a wooden box, capable of being hermetically closed, and containing water to the depth of about ⅜-inch, or having a supply of wet rags at the bottom. The box was closed, and the evaporation which took place kept the air saturated with moisture, and so the gills of the fish were kept from drying up. A current of oxygen, which had previously been passed through several water-bottles in order to become saturated with moisture, was led through the box by a tube. By these means the fish were provided with their supply of oxygen through the necessary medium of water, the latter being in the form of vapour.

Carp, tench, and other fish remained in the box for from three to four days perfectly well, and, when placed in water to be fed, they swam about in a lively manner, and appeared perfectly fresh.—"Agricultural News," Barbados.

A POSSIBLE MARKET FOR CALABASH GOURDS.

The Colonial Botanist, Mr. F. M. Bailey, has received from Messrs. Field and Villars, of the Australian Calabash Pipe Factory, Pitt street, Sydney, two calabash pipe bowls—one, silver-mounted, ready for use; and one prepared, ready for mounting—also a pipe head made of the seed capsule of one of the gum-trees (*Eucalyptus mineata*); the latter, however, is, as the makers say, not likely to come into favour with the public, being too clumsy. The calabash pipe is, on the contrary, very handsome, looking much like a meerschaum, and equally light. The firm named announce that they will buy large quantities of these little gourds at £12 per 1,000, f.o.b. Brisbane. A very small plot of ground will grow thousands of them, and, on good soil, they thrive as well as

pumpkins, melons, or chokos in Queensland. They must be without flaw, and, when ripe, exposed to the sun until they bleach to a very light-yellow colour. Whilst growing, the gourd, when possible, must be placed with the large end downwards, in order to secure the shape. After being cut, and during the bleaching process, care must be taken not to leave them exposed to rain or dew. Before shipping the gourds, the thick end must be cut off, as it is not used. If growers send three or four gourds to Sydney, they will there be cut as required, and returned to the sender as a guide. Only the stem portion is used for pipe bowls. At present these gourds are imported from South Africa. Queensland farmers, gardeners, and others could easily capture the trade, and, seeing with what little trouble the gourds can be produced in large quantities, the price of £12 per 1,000 should be very remunerative. Mr. Bailey is of opinion that this kind of gourd will do best, for pipe-making purposes at least, on the tableland from Toowoomba to Warwick. The warmer coast land, he thinks, would produce gourds too large for the purpose required.

LARGE SHEAF OF WHEAT.

A splendid sheaf of wheat was lately on exhibition in one of the shops in Roma (says the "Western Star" of 2nd October). The wheat, which was Ward's Prolific, was about 4 feet 6 inches high, and the ears were about 5 inches long and well developed. It was grown by Mr. John Brumpton, of Hodgson, and is said to be a fair average example of 100 acres under crop. The land was ploughed early in April, and the grain was sown in May. The secret of Mr. Brumpton's success is reported to lie in the fact that before ploughing his land he turned his sheep into the paddock, the result being that the moisture which otherwise would have been lost through the growth of weeds was retained in the soil, and, despite the dry season, has yielded what is regarded as fine a crop of wheat as the district has produced.

COTTON SEED PRODUCTS.

In the old days of cotton-growing in Queensland, thousands of tons of cotton seed (Uplands) were thrown into the rivers or left to rot in heaps near the ginning establishments. To-day, the seed is almost as valuable as the lint. The following table shows what cotton-ginners lost by throwing away the seed, which contains per short ton:—

	Lb.	Per Cent.
Short lint	75 ...	3·75
Hull (husks)	925 ...	46·25
Oil (52 gallons) ...	390 ...	19·50
Meal	610 ...	30·50
	2,000 ...	100·00

Crude cotton-seed oil is worth £26 to £27 per ton; cotton-seed meal, from £5 to £6 per ton; short lint, £3 to £4 per ton; hulls, £2 per ton; oil-cake, £7 per ton. At these prices, in 1 ton of seed, the oil is worth £4 16s.; the meal, £1 10s.; the hulls, 18s.; and the lint, 2s.; total, £7 6s.

Answers to Correspondents.

TO FIND THE VOLUME OF A DAM.

J. E. GOODGER, Wyuna Vale, Nanango.—

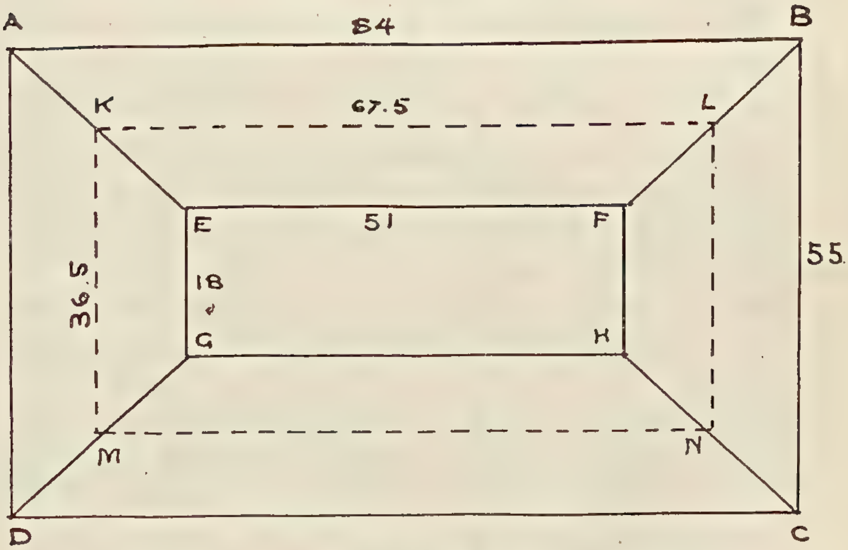
The amount of excavation on the first dam is 760 cubic yards 4 cubic feet. The excavation on the second dam amounted to 725 cubic yards (nearly).

The rule for ascertaining the volume of a dam with perpendicular sides, either square or oblong, is simple—viz., multiply the length, breadth, and depth together, whether it be yards or feet. The result will be the content in cubic yards or cubic feet. If the latter, divide by 27 to reduce to cubic yards. Where a dam has sloping sides or is irregular in length, breadth, or depth, a more intricate rule must be used.

In the present case, the dams have sloping sides, hence the rule is: Add together the areas of the top and bottom, and four times the area of the mid-section of the dam (shown by the dotted lines in the accompanying diagram). Multiply this sum by the depth, and divide by six. The result is the volume of the dam.

The formula is:—Volume of Dam $= \frac{D}{6}(A_1 + A_2 + 4MS)$.

FIRST DAM.



Area of Top ABCD(A_1) $= 84 \times 55 = 4{,}620$ square feet.
Area of Bottom EFGH(A_2) $= 51 \times 18 = 918$ „ „
Area of Mid Section (MS) KLNM $= 67{\cdot}5 \times 36{\cdot}5 = 2463{\cdot}75$ sq. ft.

$$(KL = \frac{AB + EC}{2} = \frac{84 + 51}{2} = \frac{135}{2} = 67.5 \text{ feet}).$$

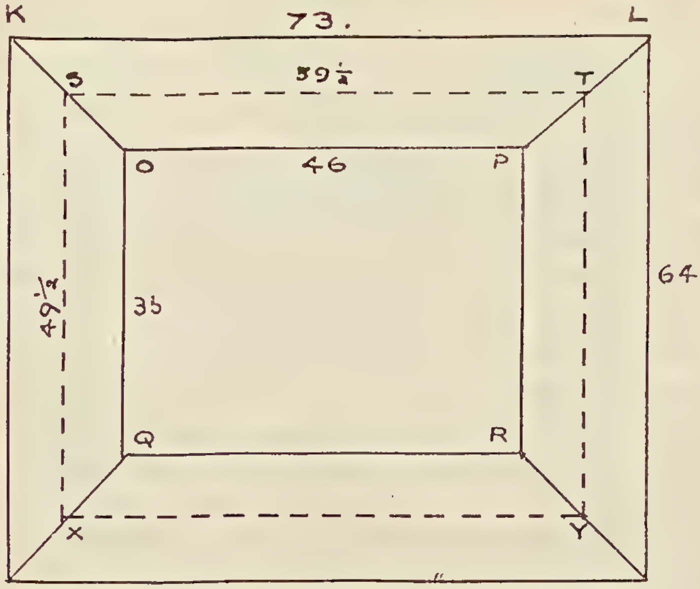
NOTE.—KL and KM can be got equally well by actual measurement.

$$\text{Volume of Dam} = \frac{D}{6}(A_1 + A_2 + 4MS) =$$

$$\frac{8}{6}(46{\cdot}20 + 918 + 4 \times 2463{\cdot}75) = \frac{4}{3}(4620 + 918 + 9855) = \frac{4}{\cancel{3}} \times \frac{\overset{5131}{\cancel{15393}}}{1} =$$

20,524 cub. feet = 760 cub. yds. 4 cub. ft.

SECOND DAM.



As above, Volume of Dam $= \frac{D}{6}(A_1 + A_2 + 4MS) =$

$$\frac{6\frac{1}{2}}{6}(4672 + 1610 + 4 \times 2945\tfrac{1}{4}) = 19{,}568\tfrac{1}{4} \text{ cub. feet} = 725 \text{ cub. yards nearly.}$$

NUMBER OF PLANTS REQUIRED PER MILE AND PER ACRE.

NEW CHUM, Cooran.—We gave this information in the second volume of the "Journal," May, 1898, also in the eleventh volume, October, 1902. As you and many other settlers in the State have in all probability not seen those journals, we republish the tables for your and their information:—

NUMBER of TREES PER MILE, FROM 10 FEET TO 100 FEET APART.

Distance.	Number per Mile.	Distance.	Number per Mile.	Distance.	Number per Mile.
100	52	65	81	30	176
95	55	60	88	25	211
90	58	55	96	20	264
85	62	50	105	15	352
80	66	45	117	10	528
75	70	40	132		
70	75	35	151		

NUMBER OF PLANTS REQUIRED TO PLANT ONE ACRE OF LAND, FROM 1 FOOT TO 30 FEET FROM PLANT TO PLANT.

Distance Apart.	Number per Acre.	Distance Apart.	Number per Acre.	Distance Apart.	Number per Acre.
30	48	14	222	5	1,742
28	55	13	257	4½	2,151
26	64	12	302	4	2,722
24	75	11	360	3½	3,556
22	90	10	435	3	4,840
20	100	9	557	2½	6,970
19	120	8	680	2	10,890
18	134	7	889	1½	19,360
17	150	6½	1,031	1	43,560
16	169	6	1,201		
15	193	5½	1,440		

Fourteen thousand strawberry plants will plant 1 acre, if planted 3 feet apart in the rows at a distance of 12 inches between the plants.

The number of plants to the acre also depends on whether they are set to form squares or equivalent triangles, as shown below :—

Distance Apart.	Number per Acre.		Distance Apart.	Number per Acre.	
	Square.	Triangle.		Square.	Triangle.
1 foot	43,650	50,300	12 feet	302	348
2 feet	10,890	12,575	14 ,,	222	256
3 ,,	4,840	5,889	15 ,,	193	222
4 ,,	2,722	3,143	16 ,,	170	191
5 ,,	1,742	2,011	18 ,,	134	164
6 ,,	1,210	1,397	20 ,,	109	125
7 ,,	888	1,025	25 ,,	69	79
8 ,,	980	785	30 ,,	48	55
9 ,,	537	620	35 ,,	35	40
10 ,,	435	502	40 ,,	27	31

When the distances between the plants differ from that between the rows, divide 43,560, the number of square feet in an acre, by the number of square feet to each plant, and the quotient will be the number of plants to the acre. The square feet to each hill is found by multiplying the number of feet between the rows by the number of feet, or fraction of a foot, between the plants.

Number of Pipes required for Thoroughly Sub-draining an Acre of Land.

Length of Pipe.	Distance Apart of Drains.	Number of Pipes.	Length of Pipe.	Distance Apart of Drains.	Number of Pipes.
Inches.	Feet.		Inches.	Feet.	
12	10	4,356	12	17	2,562
,,	12	3,630	,,	18	2,423
,,	15	2,904	,,	20	2,178

REMOVING AND IMPOUNDING STOCK.

W. Johnson, Electra, Burnett River.—

Without a full knowledge of local conditions, we cannot satisfactorily answer your questions as set forth in your letter of 12th November. We should advise you to take legal advice on the matters you complain of.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	NOVEMBER. Prices.
Apples, Eating, Local, per packer	...
Apples, Cooking, Local, per packer	...
Apples, Tasmanian, Cooking	14s.
Apricots, Local, per packer	...
Bananas, per dozen	2½d. to 4d.
Bananas, Local, per bunch	...
Cherries, per quarter-case	3s. to 7s. 6d.
Custard Apples, per quarter-case	...
Grapes, per lb.	...
Lemons, Local, per packer	...
Mangoes, per case	4s. 6d. to 6s. 6d.
Nectarines, per quarter-case	...
Oranges, per packer	9s. 6d.
Papaw Apples, per case	...
Passion Fruit, per quarter-case	3s. 1d. to 4s. 6d.
Peaches, per case	...
Peanuts, per lb.	...
Pears, Imported, per case	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	1s. 6d. to 3s.
Pineapples (smooth leaf), per dozen	2s. 6d.
Plums, quarter-case	...
Quinces, per case	...
Rockmelons, per dozen	...
Rosellas, per bag	...
Rosellas, per quarter-case	...
Strawberries, per tray	...
Tomatoes, per quarter-case	4s. 6d.
Watermelons, per dozen	...

SOUTHERN FRUIT MARKET.

Article.	Prices.
Apples, Tasmanian, per case	12s.
,, American, per case	18s.
Apricots, per quarter-case	11s.
Bananas, Fiji, per case	15s. to 16s.
,, ,, per bunch	3s. to 8s.
,, Queensland, per bunch	2s. 6d. to 5s. 6d.
,, ,, per case	14s. 6d. to 15s.
Cherries, per quarter-case	6s.
Gooseberries, Tasmanian, per quarter-case	7s.
Lemons, Ordinary, per gin case	...
Loquats, per box	...
Mangoes, Queensland, per case	8s. to 10s.
Mandarins, Queensland, in Melbourne, per case	14s.
Oranges, Queensland, in Melbourne, per case	...
Oranges, Common, per case	11s.
Oranges, Navel, per case	20s.
Pears, Victorian Vicars, per box	...
Persimmons, per half-case	...
Passion Fruit, per case	3s.
Peaches, per case	10s.
Pineapples, Queensland Queen's, per case	7s. to 8s.
Pineapples, Choice (Common), per case	7s. to 8s.
Tomatoes, Choice Queensland, per quarter-case	4s. to 5s.
Tomatoes, Others, per quarter-case	2s. to 3s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR NOVEMBER.

Article.		NOVEMBER. Prices.
Bacon, Pineapple	lb.	10d.
Bran	ton	£6 5s. to £7.
Butter, Factory	lb.	1s.
Chaff, Mixed	ton	£6 10s. to £7.
Chaff, Oaten	"	£6 5s. to £6 10s.
Chaff, Lucerne	"	£7 to £8 10s.
Chaff, Wheaten	"	£4 5s. to £4 15s.
Cheese	lb.	8¼d. to 10d.
Hay, Oaten	ton	£7 to £8.
Hay, Lucerne	"	£5 15s. to £7.
Honey	lb.	1¾d. to 2¼d.
Maize	bush.	4s. 10d. to 5s.
Oats	"	3s. 7d. to 3s. 9d.
Pollard	ton	£6 15s. to £7 5s.
Potatoes	"	£6 to £10 10s.
Potatoes, Sweet	"	...
Pumpkins	"	...
Wheat, Milling	bush.	5s. to 5s. 3d.
Wheat, Chick	"	...
Onions	ton	£6 10s. to £13 10s.
Eggs	doz.	6d. to 8d.
Fowls	pair	1s. 8d. to 2s. 6d.
Geese	"	...
Ducks, English	"	3s. to 3s. 9d.
Ducks, Muscovy	"	4s. 8d. to 5s. 6d.
Turkeys (Hens)	"	7s. to 8s. 6d.
Turkeys (Gobblers)	"	12s. to 19s.

ENOGGERA SALEYARDS.

Animal.	OCTOBER. Prices.
Bullocks	£9 12s. 6d. to £11 10s.
" (Extra)	£14 12s. 6d.
Cows	£9 17s. 6d. to £10 15s.
Merino Wethers	22s. 9d.
C.B. "	24s.
Merino Ewes	19s. 3d.
C.B. "	19s.
Lambs	15s. 9d.

Orchard Notes for January.

By ALBERT H. BENSON.

The Orchard Notes for the month of December apply equally to that of January, especially the remarks anent the handling and marketing of fruit and the treatment of various fruit pests. The fruit of the month is the grape, and growers should take every care to market this fruit properly. The fruit should be cut when dry and cool before the heat of the day, and should be firmly packed into cases of moderate size, as if the grapes are at all tender they are apt to be badly crushed if packed in too large cases. For shipping high-class grapes such as Black Muscat of Alexandria, White Muscat of Alexandria, Waltham Cross, or even Raisin de Dames, I strongly advise growers to use 5-lb. chip baskets, eight or ten of which go to a crate, as the fruit carries better in them, and will reach its destination with the bloom on if well packed and carefully handled. The fruit should be sold in the chip basket, so that the purchaser gets the grapes as packed in the vineyard and without being handled by the retailer. This method of packing grapes is common in California, especially where the fruit has to be shipped long distances; and as our best grapes here come from the Roma and Mitchell districts, and are often more or less damaged in transit, it should be of value to us in that it would enable the fruit to be marketed in a better and fresher condition than is the case at present.

I do not think such chip baskets are obtainable in Queensland, but if not they could be easily introduced, as they are now coming into regular use in Melbourne.

Mangoes will also be ripening in the Southern part of the State towards the end of the month, and I strongly advise if any are to be shipped to the Southern States that none be sent unless they are of good quality, as the carrot-flavoured stringy rubbish that has been sent in the past has simply killed the demand for mangoes in the Southern markets, and it will be impossible to open up a trade for our fruit there unless it is of good quality, and this good quality must be maintained. As there is a great deal of uncertainty as to what constitutes a good mango, I may say briefly that a good mango should be fibreless or nearly so, and should have no pronounced unpleasant flavour of carrots or turpentine, but should be either a luscious high-flavoured fruit or a juicy, good-flavoured, sprightly fruit. Too large mangoes are not an advantage, a round mango of 6 or 8 oz. weight being about the best size and shape for packing and carrying.

During the month see that the orchard is kept well cultivated; and in dry districts, where there is water available, citrus trees should receive a good irrigation. Keep the nursery clean, look after all grafts or spring buds, and see that they are growing clean and straight, and where strong enough head back at the height at which it is desired to form the head of the tree. Budding of all kinds of fruit trees can be done during the month, the only requisites to success being that the buds are fully developed and that the bark of the stock runs freely. For budding use a very sharp knife, and see that you cut your buds thin—*on no account remove the wood from the bud*, as it only makes the operation slower and does no good; in fact, the quicker the budding is done, and the less the inner bark of the bud or stock is exposed, the better will be the take. Always tie your buds firmly, especially so at the base of the bud, as it is there that the union must take place. As soon as the bud has taken properly, the ties should be cut; otherwise they are very apt to cut into and destroy the stock.

Farm and Garden Notes for January.

Field.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cow-peas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole.

Kitchen Garden.—A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in a covered seed bed, which must be well watered and carefully protected from insect pests. Sow in narrow, shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather sow French beans, cress, cauliflowers, mustard, cabbage, celery, radish, for autumn and winter use. Sow celery in shallow, well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying, also garlic, onions, and eschalots as the tops die down.

Flower Garden.—To make the flower beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost, then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one, with a knife or a zinc label—*never pull them up by hand,* as by so doing the tender rootlets are broken and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Then keep a sharp lookout for slugs and caterpillars. Keep a supply of tobacco dust on hand, and scatter this in the path of the slug, and he will cease from troubling you.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large Scarlet Foxhunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work. The flower garden in autumn and winter will present a charming sight, and will afford light and profitable work for girls with spare time on their hands.

Times of Sunrise and Sunset at Brisbane, 1907.

DATE.	SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·4	5·33	5·29	5·47	4·59	6·5	4·46	6·28
2	6·3	5·34	5·28	5·48	4·58	6·6	4·46	6·28
3	6·2	5·34	5·27	5·48	4·57	6·6	4·46	6·29
4	6·0	5·35	5·26	5·49	4·57	6·7	4·46	6·30
5	5·59	5·35	5·25	5·49	4·56	6·8	4·46	6·31
6	5·58	5·36	5·24	5·49	4·55	6·8	4·46	6·31
7	5·57	5·36	5·23	5·50	4·54	6·9	4·46	6·32
8	5·56	5·37	5·22	5·51	4·54	6·10	4·46	6·33
9	5·55	5·37	5·21	5·51	4·53	6·11	4·46	6·33
10	5·54	5·38	5·20	5·52	4·53	6·11	4·47	6·34
11	5·53	5·38	5·19	5·52	4·52	6·12	4·47	6·35
12	5·52	5·38	5·18	5·53	4·51	6·13	4·47	6·35
13	5·50	5·39	5·16	5·53	4·51	6·14	4·47	6·36
14	5·49	5·39	5·15	5·54	4·51	6·14	4·47	6·37
15	5·48	5·40	5·14	5·54	4·50	6·15	4·48	6·37
16	5·47	5·40	5·13	5·55	4·50	6·16	4·48	6·38
17	5·46	5·41	5·12	5·55	4·49	6·17	4·48	6·39
18	5·45	5·41	5·11	5·56	4·49	6·18	4·49	6·39
19	5·44	5·42	5·10	5·57	4·48	6·18	4·49	6·40
20	5·42	5·42	5·9	5·57	4·48	6·19	4·50	6·40
21	5·41	5·42	5·8	5·58	4·48	6·20	4·50	6·41
22	5·40	5·43	5·7	5·58	4·47	6·21	4·51	6·41
23	5·39	5·43	5·6	5·59	4·47	6·22	4·51	6·42
24	5·38	5·44	5·6	6·0	4·47	6·22	4·52	6·42
25	5·36	5·44	5·5	6·0	4·47	6·23	4·52	6·43
26	5·35	5·45	5·4	6·1	4·46	6·24	4·53	6·43
27	5·34	5·45	5·3	6·2	4·46	6·25	4·53	6·44
28	5·33	5·46	5·2	6·2	4·46	6·25	4·54	6·44
29	5·32	5·46	5·1	6·3	4·46	6·26	4·54	6·44
30	5·31	5·47	5·0	6·4	4·46	6·27	4·55	6·45
31	...	...	5·0	6·4	...	...	4·56	6·45

PHASES OF THE MOON.

			H. M.
8 Sept.	●	New Moon	7 4 a.m.
15 ,,	☾	First Quarter	1 40 p.m.
22 ,,	○	Full Moon	7 34 a.m.
29 ,,	☽	Last Quarter	9 37 p.m.
7 Oct.	●	New Moon	8 21 p.m.
14 ,,	☾	First Quarter	8 2 ,,
21 ,,	○	Full Moon	7 16 ,,
29 ,,	☽	Last Quarter	5 51 ,,
6 Nov.	●	New Moon	8 39 a.m.
13 ,,	☾	First Quarter	3 14 ,,
20 ,,	○	Full Moon	10 4 ,,
28 ,,	☽	Last Quarter	2 21 p.m.
5 Dec.	●	New Moon	8 22 p.m.
12 ,,	☾	First Quarter	0 16 ,,
20 ,,	○	Full Moon	3 55 a.m.
28 ,,	☽	Last Quarter	9 10 ,,

The approximate times for sunrise and sunset at Rockhampton, Townsville, and Cooktown may be obtained by *using the table for Brisbane, and adding* the following figures:—

1907.	ROCKHAMPTON.		TOWNSVILLE.		COOKTOWN.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.
September 1 to 22	9 m.	11 m.	24 m.	30 m.	27 m.	35 m.
,, 23 to 30	10 m.	10 m	28 m.	26 m.	32 m.	30 m.
October	12 m.	8 m.	32 m.	22 m.	38 m.	24 m.
November ...	16 m.	4 m	40 m.	14 m.	50 m.	12 m.
December ...	18 m.	2 m.	44 m.	10 m.	55 m.	7 m.

THE

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GENERAL INDEX.

Agriculture.

No. 3.—MARKET GARDENING.

By A. J. BOYD.

CARROTS.

The best crops of carrots are grown on rich sandy soil which has been heavily manured for a previous crop. Soil treated with rank new manure will not grow good carrots, as they invariably grow coarse and flavourless if the manure is too new. Therefore, if the soil requires enriching, have the manure applied some time previous to sowing the seed, and it ought also to be ploughed deeply to enable the roots to grow long and straight. If the ground is hard underneath, the carrots will fork out, and perhaps growth may take place from the sides of the roots instead of continuing straight downwards.

A good time to sow the main crop of carrots here is in March or April, although with a little care they may be grown all the year round. The soil should be made as fine as possible before sowing the seed, because carrot seed is of a very perishable nature, and the finer the soil is the better is the prospect of its germinating well. The drills may be from 16 inches to 3 feet apart, the latter distance being preferable where plenty of land is available, because the greater distance between the rows will make the work of cleaning and cultivating much easier, enabling most of it to be carried on by means of horse implements. The drills should not be more than 1 inch or 1½ inch deep, and, after sowing and covering in the drills, a light roller should be passed over the ground to break all the lumps in the soil, and also to assist the seed to germinate. When the plants are a few inches high, they must be thinned out to from 3 to 6 inches apart, and after that the only requirement of the crop is that the ground be kept well stirred and free from weeds.

Carrots should be fit for use in from 80 to 100 days after sowing.

There are two distinct types of carrots grown for table use—the Shorthorn and the Intermediate. The former comes to maturity early, and is perhaps the best for small gardens; but for growing on a large scale the longer varieties are the most profitable.

Manure for Carrots: Should the land require manuring, then, following a moderate quantity of dung for the last crop, give from 4 to 6 cwt. of superphosphate and 1 cwt. of sulphate of potash per acre, followed by a top-dressing of 2 cwt. of nitrate of soda per acre after the plants are well up, and, in some seasons, a further 2 cwt. of nitrate of soda a month later.

PARSNIPS.

The culture of the parsnip is very easy, and is precisely the same as that of the carrot. Depth of soil is of primary importance, and new seed should always be obtained, as parsnip seed does not retain its germinating power much longer than a year. To obtain good roots the ground must be either trenched or ploughed very deeply. The seed may be sown in March or April for the main crop, in drills from 2 to 3 feet apart, the plants being afterwards thinned out to 8 or 9 inches. They should be ready for use in about 100 days after germinating.

The most suitable manure for parsnips is the same as is given for carrots.

TURNIPS.

There are many different varieties of garden turnips, but most of them are pretty much alike in flavour and size. The smaller kinds, which are usually either white, reddish, or purplish in colour, are those usually grown

in gardens, the large Swede turnips being, strictly speaking, a field crop, although they are by no means to be despised in the garden, provided there is plenty of room for them.

Turnips succeed best in cool, moist situations, but they may be grown during the winter in many parts of Queensland; some varieties even may be had all the year round, except in the very hottest part of the summer. Well-worked, moderately rich soil will grow good turnips. The drills may be from 16 inches to 2 feet or more apart, and about 1 inch to 1½ inch deep. Thin out the plants to 4 or 6 inches, and cultivate well whilst growing. Turnips are sometimes attacked by aphides, which, if not checked, spread with alarming rapidity, and will soon exterminate a whole field. Spraying with kerosene emulsion or tobacco water, on first noticing the pest, will usually effectually get rid of the pest. The same larva or grub which is so destructive to young cabbage plants, frequently attacks turnips in warm weather, and sometimes a whole crop will be cleared off in a few days by this pest. The best remedy is spraying with Paris green, care being taken, however, that the turnips are not used for some time after spraying.

Manure for Turnips: Bonedust, lime, ashes, and gypsum are good special manures. During dry weather the plants should be watered with diluted liquid manure. If freshly slacked lime is worked into the soil to be sown in turnips, at the rate of 40 to 50 bushels per acre, a month before sowing the seed, the trouble known as "Finger and Toe" will be completely overcome, and the effect of the lime will be felt for some years afterwards.

Turnips may be sown in August, September, and October for a main crop, and occasional sowings may be made during January, February, and March. The best garden varieties are the White Dutch, Early Snowball, Orange Jelly, and Red American Stone. Turnips mature in from 65 to 90 days.

BEETROOT.

Good beetroot may be grown in almost any kind of soil, provided that it is well broken up, and not of too stiff and clayey a nature. Still, the best beets will be produced in fairly rich, dry, sandy loam soils. As in the case of the carrot and parsnip, fresh new manure should never be used for beetroot. If manuring is necessary, it should be done some time before the seed is sown, and be well mixed with the soil. The seed may be sown for the winter crop in February or March, and for the summer crop in August or September; or, by sowing a little every six weeks or so, a constant supply can be kept up all the year round. Sow in the same way as turnips, and thin out to 8 or 9 inches. When thinning the plants, any blank spaces which may occur in the rows can be filled up, as beet stands transplanting well.

There are two kinds of beet grown as garden crops—namely, the Red Beets (which may be either turnip-rooted or long-rooted) and the Silver Beets. Of the former, only the roots are used, chiefly in the form of salads, and of the latter the leaves are cooked as spinach, and make a very palatable dish, especially when other vegetables are scarce. They are very hardy, and will live through weather that would kill almost any other kind of vegetable. For sowing the seeds of all the crops already mentioned, no better implement can be used than a Planet Junior seed drill, which does the work of three men in less time than it could be accomplished by any other means.

Manure for Beetroot: Should the land require manure, a light dressing of dung is desirable, with from 4 to 6 cwt. of superphosphate and 4 cwt. of nitrate of soda per acre, 2 cwt. of the nitrate being applied shortly after the plants are up, and a further 2 cwt. a month or so later. Potash is not necessary when dung is used. A dressing of salt dug in with the manure will be found beneficial, and the fine bonedust or phosphatic manure as stated are highly valued by this crop. Beets may be taken up in 40 days after planting.

RADISH.

Of all vegetables, radishes are the most easily grown, and, next to mustard and cress, give the quickest return, maturing in 40 days. They may be sown at intervals throughout the whole year. In the spring small sowings may be made fortnightly. A light rich garden soil is suitable for them. If sown broadcast, the seed should be covered evenly about ½-inch deep with soil, and the plants thinned out to about 4 inches apart. The seed may be sown a little deeper in summer than in winter, and in dry weather give the bed a good soaking of water when required, as the plants should be forced to grow quickly and used young.

On all farms and market gardens heaps of manure are to be found crude, fresh, and containing a large amount of heat. This heat can be utilised by market gardeners to get very early crops of radishes in the following manner:—Level down the heaps and extend them as far as they will go, leaving depth enough for some further amount of fermentation. Light free soil to the depth of about a couple of inches should then be spread over the whole, and the seeds promptly sown thereon. They must be well raked in to conserve them from birds. Very fine long radishes may be quickly produced in this way.

Some Good Varieties of Radishes.

Long: Brightest Scarlet, a good French kind; Knickerbocker grows to a very large size, often to 8 inches in length; Iceberg Long White. Semi-long: Chinese Rose; Delicacy, one of the best. Turnip-rooted: Golden Dresden; French Breakfast; Red and White Turnip; New Rocket, which can be obtained both long and turnip rooted.

KOHL-RABI.

The kohl-rabi is a vegetable belonging to the same order as the turnip, but differing from the latter in that the enlargement at the base appears as a swelling of the foot stalks of the leaves instead of the root. There are two varieties, the green and the purple, with large and small leaves. The special advantages of this plant are—its immunity from insect attacks, the great extent to which it resists frosts, its remarkable power of standing frost, and its freedom from mildew. It will stand transplanting better than any of the root crops, which renders it valuable for filling up blanks.

The time for drilling in the seed is August, September, and October, but sowings may also be made in February and March, at the rate of 3 or 4 lb. per acre. The cultivation is similar to that for the turnip. The distance for singling is from 12 to 16 inches, the globe-shaped requiring more space than the oval. As a table vegetable the kohl-rabi is far superior to the turnip.

Manure for Kohl Rabi: The same as for turnips, but land in good heart will require no additional dressing. The plant reaches maturity in 100 days.

LETTUCE.

The lettuce likes a fairly rich soil, and if the soil is not naturally rich make it so with the best manure available, for lettuce, unless rankly grown, is not crisp or sweet. Sow the seeds in boxes or in well-shaded beds, and, when large enough, plant them out in rows 18 inches apart, and the plants 1 foot apart in the rows. They may be planted between the cabbage rows, as they will be ready to cut long before they can interfere with the latter. The cabbage lettuce is the most satisfactory to grow, and is also in most general demand at all seasons. The "Cos" section are loose-growing, and to get them in edible condition the hearts are bleached by tying up the leaves so that the outer exclude light from the inner ones.

A warm and dry situation should be chosen for the winter crops, and one that is low and damp for those of summer. For summer crops sow in August

and September, where the plants are to remain, and thin out to 12 inches. For winter crops, sowings may be made in February and April, and the plants put out in rows the same distance apart.

The Iceberg is one of the best of the cabbage lettuces. Lettuces mature in from 45 to 75 days.

ENDIVE.

Endive is an extremely useful salad, and very easy of cultivation. When lettuce refuses to heart because of temperature, then endive comes in as a valuable substitute. The great secret of success with this plant is to secure perfect blanching by the exclusion of light. Unless the heart is thoroughly bleached, so that the green leaves in the middle become of a pale-primrose colour, the proper end has not been achieved. There is a strong bitterness in the unbleached foliage, which only disappears after being hidden from the light for several days. As endive can be planted 12 inches apart either way, it is called a foot crop, and a small plot produces a quantity of stuff. In bleaching endive, it may be matured by closing the top of the leaves with a strip of fibre, or by laying a flat tile on the plant. The latter method is followed more on the Continent, and, as it excludes light, rain, and air, it produces a like effect to tying up.

Sow in February and March. Rich soil is indispensable if a fine and delicate quality is desired. Endive matures in from 65 to 75 days.

CELERY.

A good, deep, rich, vegetable mould in a moist situation is best suited for celery. For the seed bed or box, make up a mixture of fine loam, leaf mould, and sand. Sow the seeds thinly, cover very lightly, preferably with sifted stable droppings or decomposed manure, and slightly shade them. When the plants are up and the rough leaf is a little advanced, prepare a bed by mixing 2 inches of well-rotted manure with about 3 inches of the soil. Level the surface, water thoroughly, and a few hours afterwards, in the evening, plant out the seedlings 5 or 6 inches apart. Slightly shade them, and then prepare a similar bed for planting out for succession. For the final planting, throw out trenches 1 foot broad and 1 foot deep, at 5 feet apart from centre to centre. At the bottom, lay 4 inches of well-rotted manure, and dig it in with a fork. Give the whole a good soaking with water. Now, take up your plants, being careful to leave a good ball of earth on the roots. Then take a stiff piece of brown paper, and make a collar or case, and wrap it round the lower part of the plant, leaving the top free. As the plant grows, this can be lifted. The object of this is to enable you to heap in the soil against the plants without any of it getting inside them. Keep on drawing the earth up to them to within 6 inches of the top. This must always be done in dry weather. Give plenty of water and occasionally some liquid manure. A little salt sprinkled on the soil once or twice, followed by a good watering, will be beneficial. One ounce of celery seed will be sufficient to plant out an acre. Good varieties are—Cole's Crystal White, Lang's Mammoth Red.

Sow from January to March. Celery matures in 150 days.

ONIONS.

The most suitable soil for onions is a rich sandy loam, free, friable, and easy to work, a soil that will not cake, and not lying so low as to retain the superabundant moisture after heavy rains. In such a case the land should be well drained. An eastern or south-eastern aspect has been proved to be better than if the land sloped to the west, as the onion does not require intense heat to bring it to perfection.

Before sowing the seed, it is important that the seed beds should be clear of weeds and of their fallen seeds. By sowing in April or May there is

not much to fear from weeds; still, it is advisable that the land, both of the seed beds and of the area proposed to be planted out, should be turned up and exposed to the weather for some time previous to sowing. As soon as the weeds appear, give the land a good scuffling, and if this be done two or three times between February and April there will be no trouble afterwards. If the soil be not virgin scrub, or if it has borne crops for many years in succession without manuring, it should be thoroughly well manured with stable dung, ashes, bone dust, &c., as the onion demands plenty and the best of nourishment. New scrub land is rich enough in natural fertilisers not to require any additional manure.

In planting out onions, a very serious mistake is often made, and that is, the soil is carefully worked, reduced to a fine tilth, and the plants are set out in a soil which is loosened to a depth of perhaps 8 inches. From land prepared in this manner no good results need be expected. The onion requires a firm bed; otherwise the plant, instead of making a large well-shaped bulb, will run to neck, and have more the appearance of a leek than of an onion. Therefore the land, before being planted, must be well solidified by rolling.

Onions may be sown broadcast or they may be drilled in, or they may be sown in a seed bed and afterwards planted out in the same manner as cabbages. The best way is to drill them in. In this case about 2 lb. of seed will be required. The seeds must be dropped at a distance of about 2 inches apart in the drills, and the drills should be from 12 to 15 inches distant from each other. The plants will afterwards require to be thinned out with the hoe. When sown in a seed bed, planting out must be resorted to—a tedious process, but one that pays for doing well. On rich soil the plants may be 6 inches apart. The drills should be slightly raised, and the roots of the plant firmly embedded in them. Allow the bulb to, as it were, squat on the surface, not under it. As the plant grows, the soil must be kept perfectly clear of weeds, and, where the working of the ground has thrown the soil against the bulbs, it must be drawn down, so that only the root is in the ground. Where this has not been attended to, the remedy for the resulting want of bulb-formation is to wring the necks of the plants, or at least to bend them down with a twist. This will have the effect of inducing the formation of bulbs. When sowing the seed, care should be taken that they are not covered to more than their own depth. If sown deep, many seeds fail to germinate, and most of those that do appear will make an abnormal growth of neck, causing much labour in drawing away the soil from the incipient bulbs. The writer has never sown onions broadcast, and, therefore, offers no opinion on the value of the method. Of course, more seed would be required per acre, and, if weeds are troublesome, a good deal of hand work would be necessary.

Now, about the seed. There are few seeds so annoyingly deceptive as onion seed, as old seed will lose its germinating power; therefore, make sure of getting fresh seed. After sowing, it should germinate in less than a week.

In former days, large onions were always aimed at, but now the public taste is in favour of medium-sized bulbs, so that closer planting may be adopted.

Spring onions may be taken up for table use in from 60 to 90 days, and the onion comes to full maturity in from 120 to 180 days. They may be known to be ripe by the drying up of the tops. As soon as this happens, take them up by hand and leave them on the ground between the rows to dry, after which carry them carefully, with as little bruising as possible, to the barn.

The principal difficulty in storing onions is their liability to sprout. This must, if possible, be avoided, because whenever growth is set up in any bulb or seed that bulb or seed deteriorates in proportion to the extent of growth. This is why, when onions are pulled, they must be left for a few hours on the ground to dry before being stored. They require constant looking over

to sort out any bad ones, for, as in the case of fruit, a single rotting onion will infect all those in its immediate neighbourhood.

The best varieties to plant are—Mammoth Silver King, which has a mild and delicate flavour. Brown Spanish is an early and exceedingly productive variety. Brown Globe, Silverskin, and Yellow Globe are all good sorts, with good keeping qualities.

Manure for Onions: A light dressing of dung, supplemented by 4 to 6 cwt. of superphosphate, 1 cwt. of sulphate of potash (or 4 cwt. of kainit), and 4 cwt. of nitrate of soda per acre.

Potash is of vital importance to onions, and should on no account be omitted.

LIME AND ITS APPLICATION TO THE SOIL.

Lime is very extensively used as a fertiliser, but its action is not generally well understood, and serious mistakes often occur from its indiscriminate use. Most soils contain all the elements of plant food in varying quantities, but, however abundant the presence of most of these essential constituents, if any one of them be absent the soil is perfectly barren, and if present in insufficient quantity the resulting crops are unsatisfactory to the extent of that deficiency. Lime cannot be classed among these deficient substances, for, although it enters into the composition of almost all forms of vegetables, life, its various compounds are so widely and generally distributed that it would be a very rare circumstance for any sample of ordinary soil to be found on analysis not to contain sufficient lime for the requirement of any cultivated plant. Then it may be asked, How is lime a fertiliser? Anything is a true fertiliser which causes a plant to make more vigorous growth and yield better crop; and lime does this in a twofold manner—viz., chemically and mechanically. First, as to its chemical action. All plant food to be available must be in a soluble condition, otherwise it is like human food under lock and key. All soils contain animal and vegetable matter in varying proportions and in various stages of decomposition. Now lime, in its caustic condition, is one of the most powerful agents of decomposition, and where, from defective drainage or other causes the land is "sour," and where organic matter does not readily decompose, the application of caustic lime often works wonders, causing these previously inert substances to yield an abundant supply of available plant food. Probably this use of lime and its compounds sometimes reacts with injurious mineral substances, producing useful or harmless compounds—for instance, the action of gypsum on carbonate of soda. The mechanical action of lime on heavy clay lands is an important aid to fertility, causing the soil to become friable, and thereby giving free access to air and water. This mechanical action is shared by several of its compounds, such as gypsum, powdered chalk, pulverised shells, &c. The common mistakes in the application of lime as a fertiliser are the following:—When its chemical action is required on sour, boggy land, it should be spread and ploughed in as soon as possible after being slaked. It is often allowed to lie in heaps for weeks and months, when it absorbs carbonic acid from the atmosphere, and becomes gradually converted into carbonate of lime or chalk. When spread and allowed to remain for some time before being ploughed in, the mischief is still greater. Considerable damage sometimes occurs from overliming. Since caustic lime greatly promotes decomposition, there is danger of bringing too large a proportion of plant food into available form, resulting in a heavy crop in the ensuing season and comparative barrenness for several years after. It is a common practice to add lime to nightsoil and other animal manures. Caustic lime sets free the ammonia, thus depriving the manures of one of its most valuable constituents.—"Mexican Investor."

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 30TH NOVEMBER, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Whitefoot ...	Holstein-Sh'rth'rn	28 Sept., 1907	773	4·4	38·09	
Reamie ...	,, ...	Oct. ,,	713	3·8	30·34	
Careless ...	Jersey	20 Oct. ,,	624	3·8	26·55	
Dot ...	Shorthorn ...	20 Oct. ,,	558	4·1	25·12	
Sue ...	Grade-Shorthorn	22 April ,,	513	4·2	24·13	
Pee-wee ...	Holstein-Sh'rth'rn	6 April ,,	542	3·9	23·67	
Chocolate ...	Shorthorn ...	5 Mar. ,,	551	3·8	23·45	
Honeycomb	,, ...	23 Aug. ,,	538	3·8	22·89	
Conceit ...	Ayrshire ...	28 Oct. ,,	547	3·7	22·66	
Bliss ...	Jersey	17 Sept. ,,	461	4·3	22·20	
Lass ...	Ayrshire ...	19 April ,,	489	4·0	21·90	
No. 112 ...	Grade-Jersey ...	19 April ,,	592	3·3	21·88	
College Lass	Ayrshire ...	14 Sept. ,,	511	3·8	21·74	
Dora ...	Shorthorn ...	9 Sept. ,,	495	3·9	21·62	
Night ...	Holstein-Devon	28 May ,,	497	3·8	21·15	
Gem ...	Shorthorn ...	29 Aug. ,,	514	3·6	20·72	
Wonder ...	,, ...	7 Dec., 1906	464	4·0	20·78	First calf
Laura ...	Ayrshire ...	20 May, 1907	535	3·4	20·37	
Dripping ...	Holstein-Sh'rth'rn	28 Nov., 1906	479	4·0	21·45	
Mona ...	,, ...	Oct., 1907	475	3·8	20·21	
Restive ...	Shorthorn ...	21 Aug. ,,	473	3·8	20·13	
Daisy ..	Holstein ...	30 Aug. ,,	493	3·4	18·77	
Nettle ...	Shorthorn ...	17 May ,,	466	3·3	17·22	
Patch ...	Guernsey-Sh'rth'n	Sept. ,,	491	3·0	16·49	
Dewdrop ...	Holstein ...	24 Mar. ,,	487	3·4	18·54	First calf

The cows were fed on 20 lb. of ensilage per cow per day, and allowed to graze on cultivation fields for two hours daily.

DAIRY NOTES.

Five pounds of skim milk is as good as 1 lb. of maize meal for feeding pigs.

On comparatively few farm dairies are milk records kept. This is unfortunate.

English farmers have for generations made extensive use of Dwarf Essex forage rape as a stock food.

Rusty cans and those with rough seams are very difficult to clean, and in bad cases only live steam or prolonged scalding will make them pure.

The length of time a cow will maintain her production depends on her constitutional strength and the care with which she is managed.

A good dairy cow should not show any marked falling off until after ten years of age.

A cow is at her best during the fifth and sixth years, up to which time the production of milk and butter fat by cows in normal condition increases.

It is well known that the farmers who are the most successful are those who make a specialty of dairying. This is due to the fact that the market is always ready for milk and butter.

Subsequent to the weaning period, calves are frequently allowed to lose in flesh, thus in a measure losing the benefit that would otherwise result from careful feeding during the milk period.

After a certain age has been reached—on the average seven years—the food required for the production of milk or butter fat again increases, both as regards dry matter and digestible components of the food.

Never before has so much attention been directed to the subject of securing pure milk under sanitary conditions for consumption in the big cities. Dairymen and farmers generally welcome this movement.

Dairy farming at present is a manufacturing industry that requires a very high grade of intelligence, the closest watching of detail, and the conscientious performance of duty, if success is to be attained and maintained.

Young animals use a portion of their food for the formation of body tissue, and it is to be expected, therefore, that heifers will require a larger proportion of nutrients for the production of milk and butter than do other cows.

There are two classes of bacteria that bring about souring. One produces a clear sour flavour; the other produces sourness, accompanied by gas, with which is usually associated a flavour varying from not quite clean to rancid.

The quality of milk produced by heifers is somewhat better than that produced by the older cows, for a decrease has been noted of one to two fifths of 1 per cent. in the average fat contents of each year until the cows have reached the full age.

A good milking cow of exceptional strength, kept under favourable conditions, whose digestive system has not been impaired by over-feeding or crowding for high results, should continue to be a profitable producer till her twelfth year, although the economy of her production is apt to be somewhat reduced before this age is reached.

It is possible for a farmer to keep twice as many cows when he makes a large profit, because he can incur greater expense in purchasing food, and thus enrich the farm with manure; but what is better, the farmer can more than double his profits with the same number of animals by using those that produce twice as much milk and butter as the common kinds.

The stomach of a cow recently killed in the Koroit district, Victoria, contained 4 lb. of quartz, a quantity of large bones, numerous pieces of glass of different shades, a number of the brass parts of cartridge cases, nails, fencing staples, lead, sandstone, sea shells, clothes buttons, and plated sleeve links. The buttons had apparently been attached to garments which had been eaten and digested.

Ropy milk contains a bacteria which causes the milk to become ropy. This bacteria is found in some waters. Therefore, milk pails, strainers, and vessels should be washed and scalded before being used, and no cold water put into the vessels after they have been scalded. The udder and flank of the cow should be washed before each milking with a solution made by mixing 1 part borax to 30 parts water.

The Tantaloola correspondent of the Millicent (South Australia) paper writes:—A cow belonging to Mr. E. Pepper died a few days ago, after a short illness, and as she was in fair condition the owner thought it advisable to hold a *post-mortem* examination. He found that the stomach contained a quantity of brass tacks, hob nails, sprigs, and screws from the plates of heavy boots, a piece of a cockatoo chain, nails about 2 inches long, and two pieces of solder. The cow had always appeared in good health.

"It is now recognised and acknowledged by all experts and leading butter-makers throughout the world that in the manufacture of high-grade butter starters are indispensable," says Mr. Shirley, Government Instructor of New Zealand, "and I will say that the butter-maker who is working under ordinary conditions and omits their use is behind the times and incompetent. In the preparation of starters the one important point is to have them absolutely free from undesirable bacteria. Therefore, it is essential that a special

NOTICE TO DAIRY FARMERS.

The attention of the country Press, dairy farmers, and factory managers is drawn to a series of articles written by Mr. G. Sutherland Thomson on his inquiries into the dairy produce trade in Great Britain, which will appear in consecutive numbers of the "Queensland Agricultural Journal," beginning in February next. These articles will give a full and detailed account of Mr. Thomson's late work in Great Britain in the interests of the Queensland dairy trade, and should be attentively studied by all who are engaged in the dairying business throughout Queensland.

room and equipment that can be kept free from any source of contamination should be provided for this purpose, that all appliances and utensils used in this connection should be free from rust or broken surfaces of any kind, and thoroughly cleansed and sterilised with live steam."

A Queensland farmer a few years ago described the method he employed to ascertain whether a cow were in calf or not. He used to milk the cow into a bucket, and, having a glass of pure water at hand, dipped a straw into the milk and allowed one single drop to fall into the glass of water. If the milk mingled with the water, rendering it cloudy, the cow was not in calf; but if the drop of milk sank to the bottom before mixing with the water she was pregnant. This test had been used for years, and was never known to mislead. The test was based upon the idea that the milk of a pregnant cow is more viscous than that of a cow which is not in calf, and thus the single drop allowed to fall into the water betrays the condition of the cow by the greater or less tendency with which it holds together.

The chief points (says the "Live Stock Journal") to be looked for in a good Hereford are—first, that the colour should be a distinct red, not too dark or too light; white face and mane, also white breast and belly, and white legs as far as the knee and hock, sometimes running up the flank. The bull should have a good masculine head, not too long, broad between the eyes, which in turn should be large and prominent, with a mild look denoting docility of temper; the horn should be of moderate length, springing straight from the head. The cow's head should be much the same, but finer, and her horns should have a curve, and turn upwards slightly; they should be in both cases of a waxy white, although they are occasionally found tipped with black; the nose should be of a pure white or flesh colour. The bull should have a good rise of crest, deep sloping shoulders, well-developed brisket, straight back and belly line, wide loin, good springing ribs, moderately broad hips, tail well set on, and falling on a plump line to the hocks. The hindquarters should be long from the hip backwards; the thighs, which are a very important point, should be large and full, showing plenty of width across when you stand behind, and they should be well meated to the hocks. The test of touch is difficult to describe, and can only be learnt by practice.—"Warwick Examiner."

LAMBS FOR EXPORT.—A FARMER'S OPINION.

There is much divergency of opinion as to the best cross for producing lambs for export purposes. Many favour the merino ewes with Shropshire or South Down rams; in fact, this has been the most common cross. A South Australian farmer, Mr. M. Rankin, recently published his experience on lamb-breeding, extending over a period of twenty years. He strongly favours the Lincoln-Merino ewe crossed with one of the breeds above mentioned. The ewes, he states, "are larger, quieter, and better mothers than the pure merino, and when too old for breeding were good butchers' sheep. The merino is small in carcass, heavily woolled, of a roaming disposition, and not inclined to put on fat when young. He had no trouble with crossbred sheep breaking bounds, as he made it a practice not to overstock. True, their wool was not of equal value to the merino, yet by care and attention it can be greatly improved. As a matter of fact, however, they could not get both fat and wool of the finest class on the same animal when young, and for lamb-breeders the sheep that put on fat instead of wool was most profitable. For the London market he had a strong preference for the use of Down rams, as the progeny matured earlier than the Shropshire cross. The Dorset Horn had come to South Australia of recent years, and, while he could not speak from personal experience, the crossbred lambs he had seen at the Roseworthy College led him to believe that this breed might prove the best of all for the lamb-breeders, as the lambs were fit for market at ten weeks to twelve weeks old.

Poultry

MANAGEMENT OF CHICKENS.

After the chickens have made their exit from the shell, it is not necessary to feed them for the first twenty-four to thirty-six hours, because immediately prior to hatching they have absorbed the yolk sac into their stomach, and this contains sufficient nutriment to sustain them for the period just mentioned. At the end of this time they should be removed from the nest, if they have been hatched under a hen, or from the drying-box when an incubator has been employed, to the coop or the brooder, as the case may be. The first feed should consist of hard-boiled eggs chopped up fine and mixed with breadcrumbs or biscuit meal. We rather prefer the latter, as the breadcrumbs are more liable to cause the chickens to scour. Eggs may at first sight appear a somewhat expensive food for chickens, but new-laid eggs need not be used for this purpose. The infertile eggs, that have been tested and rejected on the seventh day, may be used, as they do equally as well for the birds. Later on in the season, when eggs are very cheap, then ordinary new-laid ones may be used, but earlier either the infertiles should be used or else shop eggs. The eggs and biscuit meal should be slightly moistened with water or fresh skim-milk, but only moistened, and not made in a sloppy state. This diet should continue for the first three or four days, when the eggs may be discontinued, and the biscuit meal form the staple food. There are several excellent meals upon the market, and they have the great advantage of being cooked foods, so that it is only necessary to moisten them with water and they are ready to give to the birds. One of the great secrets of success with regard to the rearing of chickens is variation in feeding. It is most unwise to give the same food time after time, until the birds are bound to tire of it, however good and wholesome it may be. If the food is varied the chickens will eat with much greater relish, and as a consequence, if suitable foods are fed, the chicks will grow more rapidly and will attain a larger size than would otherwise be the case. A mixture of barley meal and toppings in equal proportions also forms a good food, and this should likewise be moistened with water, and made into the condition of what is called crumbly moist. Boiled rice is also beneficial, but it is almost useless feeding it raw, but should be cooked. When supplied to the chickens raw it passes through them very quickly, and is not properly assimilated. The correct way to prepare it is: To 1 pint of chicken rice add 3 quarts of water, and allow this to simmer—not boil—until the rice has absorbed all the water. It is a wise plan to put a little bone meal in as well, as this helps to build up a good frame. Another excellent food is oatmeal, and this should be well soaked in hot water, until the oatmeal is well swollen out, and it should then be partly dried up in barley meal or toppings. As soon as the chickens are old enough, generally at the end of a couple of weeks, they should be given some small grain, and for this purpose dari and buckwheat are very useful. Buckwheat is a grain that is not much used in this country, but it is extensively employed on the Continent, especially for feeding chickens. It is a small grain, and of a reddish-brown colour. Cracked wheat is also a good food for chicks, but it should only be cracked, and not ground up so as to be at all floury.

It is a very debatable point as to whether chickens should be given water to drink during the first few weeks. Chickens with a hen, of course, must be supplied with some, as they will drink with the mother; but with regard to artificially hatched chickens we think they are all the better without water for the first three weeks or a month. The food being given to them well moistened supplies them with sufficient, and we have always had better results with not

allowing them water to drink. On the other hand, there are breeders who always give water to the chicks, so that everyone must judge for him or for her self. The important thing is that, should one select to give water, then see that there is always a plentiful supply before the birds, because if the water dish, as is sometimes the case, is allowed to get dry and remain so for a few hours, when fresh water is given to the birds they, being very thirsty, will take a long drink, with the result that frequently liver trouble is brought about.

Chickens, if they are to be successfully reared, must have an abundance of fresh air, and one of the most fatal mistakes that can be made is to coddle the birds. Infinitely more chickens die from coddling than from exposure, and, although we do not advocate that the birds should be kept in a cold place, we do not think there is any danger in letting them run out when the weather is cold, as long as they have a warm place in which to go. Damp, of course, is another matter, and it is necessary to see that when the weather is wet plenty of good shelter shall be afforded for the birds, so that they need not go out into the open. For this purpose a double coop is very useful, and by a double coop we mean a coop to which there is a run attached. It is better placed at the side than in front, and for early work a coop of this description is almost necessary. It has a further advantage in that the chickens can be fed in the run, and the other birds running about the place and the mother herself cannot get at it. It is very annoying to find when some special food has been prepared for the chickens that the other birds are eating it, and hence a double coop would save this annoyance and loss. The coop or the brooder, whichever is employed, should be removed on to fresh ground every day, as nothing taints the ground quicker than do chickens, and should the ground become at all foul disease is certain to follow. It is never a wise plan to use the same piece of ground year after year for the rearing of chickens, because the ground so soon becomes tainted, and upon tainted ground it is absolutely impossible to successfully rear chickens.

Green food in one form or another must be given to the birds, as this is necessary to keep their systems in right order. When they can be procured, lettuce leaves are one of the best forms, but as a rule this is rather too expensive to feed to chicks. Garden refuse, such as cabbage leaves, is useful, and also onions. Onions should be given once every day, and the best way to give them is to mix with the food, having chopped them up into fine pieces beforehand. Nettles are also beneficial, and these have the advantage of keeping the blood in good order. Grit, too, must be supplied to the birds in order that they may properly masticate the food. Fowls have no teeth, and the grit has to answer the same purpose, the food being taken down into the crop, then on to the gizzard, where it comes into contact with the grit, and is ground up, so that it can be properly assimilated. By attention to detail and by treating the chickens in a common-sense manner, it will not be found a very difficult matter to rear them successfully, but care has to be exercised with them, and it is essential that all the details shall be correctly attended to.—"Agricultural Gazette."

The Horse.

CURES FOR BOTS.

The bot fly generally lays its eggs on the flanks of a horse or under the chin, almost always in spots, however, which the animal can reach with its tongue. Various suggestions have been made as to the best means to destroy the eggs. One grazier says that the simplest way is to strike matches and lightly burn the hair from the egg-infested patches without hurting the horse. To get rid of the worms inside, it has been shown by a German professor that a dose of tansy tea, followed a few hours later by half an ounce of salts, is a certain cure, hundreds of worms being passed by this means. Regular grooming would probably remove the eggs, but thousands of horses never get any grooming, and all that can be done with these is to try the match business or wash the parts with dilute carbolic acid or kerosene, or dose with tansy tea.

The United States Department of Agriculture lately described some tests upon a quantity of live bots taken from a horse which had been killed by them. Put into sage tea, they died in fifteen hours. This being too slow, they were tried with nitric acid, but that seemed to trouble them no more than water. Then they were put into an infusion of tansy; that killed them in one minute. A horse suspected of being troubled with bots was given some tansy tea in the morning and a dose of salts in the evening. The next morning the horse's excrement contained 1½ pint of the bots, and the cure, after repeated trials, is now said to be recognised as thoroughly effective.

The Orchard.

PRESERVING FRUIT IN NITROGEN DURING SHIPMENT.

At the Paris Exhibition of 1900 there was exhibited a case of fish that had been preserved in nitrogen for seven years without decaying. Reading of this, Mr. Elwood Cooper, State Horticultural Commissioner of California, was impressed with the idea that if a suitable container could be furnished at a low cost the nitrogen could be profitably used in preserving Californian fruits during shipment to foreign markets. As a result of considerable experiments, Mr. Cooper has now succeeded in producing such a container. It consists of a paper box treated with bitumen to prevent the entrance of oxygen from the outside atmosphere. After the box has been filled with fruit it is closed, except for a small opening. A number of these filled boxes are placed in a steel cylinder from which the air is exhausted. Then the cylinder is filled with pure nitrogen gas, and by means of an automatic device the boxes are sealed. Peas, grapes, cherries, and many other fruits so treated were found to be perfectly sound at the end of five months, and in the case of some damaged fruit it was seen that all decay had been arrested by the nitrogen, only the spots affected when the fruit was encased remaining without spreading to the rest of the affected fruit.

Tropical Industries.

COTTON-GROWING IN QUEENSLAND.

REPORT OF MR. D. JONES.

In October last, Mr. D. Jones, Cotton Expert of the Department of Agriculture, made a tour through the Wide Bay and Burnett and Central districts, with a view to inquiring into the possibilities of cotton-growing in those districts. He spent about six weeks on the trip, and on his return reported as follows to his Department:—

Leaving Brisbane on 7th October, my first inspection was among the farmers situated on the Kilkivan line as far as Kingaroy. I found that plots were either being sown or were already in the ground, varying from 1 acre to 5 acres. These were in nearly every case the first attempts of the settler at cotton-growing, hence information as to procedure was warmly accepted. I found in many places in this region that the shrub got severely frosted in winter, which prevented its utilisation for more than one season. In places where frost range was limited to the low lands, the shrub could with safety be left for stand-over or pruned crop. On the Kilkivan line I visited Goomeri, Murgon, Wondai, Kingaroy; all these places have large areas of good soils well suited for cotton. In a few instances growers were able, by reason of former experience in cultivating cotton, to be in a position to speak favourably of the advantage of cotton-growing. Taking advantage of train delay, I visited Nikenbah, on the Pialba line, and had an opportunity of observing the growth of some tree-cotton, which had been formerly brought under my notice.

On 12th October I left Maryborough for Gayndah. In company with Mr. Barber, I visited the group settlement. Here several of the farmers had made preparations for sowing when rain fell. This crop should be a very profitable one for the group settlers. At Biggenden I found growing in the Dillarnil Scrub some Caravonica cotton, the seed having been bought from Dr. Thomatis. This variety grows most profusely in any region out of frost reach, bearing for the most part of the year a very excellent quality of fibre. This species of cotton shrub has been in existence in many places for the last forty years, thus has become thoroughly acclimatised, and is a variety which is well worth attention, particularly in the tropical regions of the State. The dairying industry is fast becoming a popular one with settlers in the Wide Bay and Burnett districts. This, combined with the attractions of sugar-growing, will for a time be a factor that will militate somewhat against a very rapid extension of cotton-growing, particularly while juvenile labour is as difficult to obtain as at present. The greater part of my time was given to matters connected with the industry in the Central district, west of Barcaldine, beginning my first investigations at Tanby and Yeppoon, on the coast. Here I found the tree variety to which, after conferring with the growers, it was agreed to give the name of Mascotte, to distinguish it from other types growing at various places. This Mascotte variety, which is growing self-sown in great vigour, and annually producing from 2 lb. to 3 lb. of fibre in seed (in instances much more), is to be seen flourishing on the roadside and among the scrub, heavily laden with ripe fibre, uncared for and ungathered. The market value of this class of cotton seed, being at present about 2d. per lb., by reason of its large yield should attract juveniles and unemployed, who might pick it for sale.

Stanwell and Capella are the chief centres in the region where this crop is produced on a commercial scale. At Stanwell, the tillage of this crop has been in vogue for some years past, mainly through the efforts of Mr. G. Sanderson, who has been active in furthering the interests of cotton-growers in the Central district. The returns per acre for Upland varieties have been about £8. This

might have been augmented had the tillage and gathering been closer attended to. Many farmers there, particularly those who have observed the yield of the Mascotte type, favour the cultivation of that class, a proposal which, in my opinion, has much to recommend it. To those proposing the cultivation of this variety I have made the suggestion that Mascotte be sown in 8-feet distances each way, the intervening spaces sown to the dwarf Upland sorts. The result will be that an Upland crop will be taken off in six months, then at the end of another six months the tree-cotton will come into profit. This system will meet the needs of the farmer who is dependent on an early crop for his livelihood. The Mascotte, once established, will give an annual crop for many years without further replanting. In several instances under notice these shrubs were known to have borne for ten or fifteen years in defiance of drought. At Stanwell attention will be given to both these varieties, and some extended area will be sown. The cotton grown in this district has been principally Upland of good quality, the whole of which has been ginned by Mr. Sanderson, using for the process a McCarthy double action roller gin. Some of this fibre was sold to local buyers at a very satisfactory figure; a portion of the crop is, I understand, on its way to Liverpool to test the range of the British market.

At Capella considerable interest is aroused by reason of Mr. Willis Hargrove, an American cotton-planter of wide experience, having, after much investigation, selected this district as in his opinion best fitted for this pursuit. Mr. Hargrove, at the period of my visit, was engaged in preparing land for crop. Arriving in the locality rather late, his area will for this reason be a more restricted one than originally contemplated. At most he will from appearances be unable to sow this season more than about 10 or 12 acres, quite a sufficient area to determine the suitability of the district for cotton. Other farmers in the neighbourhood propose to sow plots of Upland and Sea Island varieties. The soil in this locality is a chocolate loam of great fertility. The feature of the land is open downs, lightly timbered—in fact, ready for the plough. Mr. Hargrove considers his prospects much more favourable than any yet experienced in America, and is very sanguine of turning the cultivation of cotton to advantage. At Bogantungan last year some very excellent Upland cotton was grown, samples of which were very highly valued by the British Cotton Growers' Association. This seed had been lost. My visit was necessary to recover, if possible, the variety. This I was fortunately able to do, with the result that some of the seed was distributed to many farmers in the Central district and elsewhere.

At Barcaldine I found both Upland and Mascotte varieties growing well. Several experimental plots will be grown as the results of my visit. Springsure and Gindie were visited. At each of these places farmres were interested in the crop. At Gindie some shrubs were growing uncared for, which had been in existence before the great drought, and were at the time of my visit masses of fibre. The result of my visit to these districts has been that a previously expressed opinion has been confirmed, and is that in the Central district there are thousands of square miles of country eminently suited to grow either long or short staple cotton in abundance. During my visit I did all in my power to interest such commercial men as well as farmers with whom I came in contact with a view of removing the prejudices which unfortunately exist, as well as present facts based on experience to hand. Fortunately I was able, by reason of our Southern experience, to indicate what profits would accrue, and also remove some misapprehension as to the cultivation and labour conditions connected with this vocation. In the object of my visit I have been ably assisted in the Central district by the "Morning Bulletin" and "Daily Record," Rockhampton, both papers having given extended notices of my visit and movements, and in other ways warmly espoused the purpose of cotton production. The Rockhampton Pastoral and Agricultural Society, at my suggestion, have resolved to establish a registry to meet the wishes of landowners who propose to cultivate cotton but are unable owing to the absence of cotton-pickers.

Several of the sheep and other farmers intimated their willingness to add to their pursuit that of cotton planting, providing families can be induced to migrate to their localities and take the cotton off on the share principle so much in vogue in America. The basis of agreement as suggested is a fairly liberal one, ranging from 8s. in the £ to halves. This establishes at once a sound basis on which to engage in cotton culture. Taking 8s. in the £ as a basis, the family picking would reap a return of £2 8s. to £3 4s. per acre, based on a moderate crop of Upland cotton to range from £6 to £8 per acre. If a half-share agreement operates, then the profit to the harvester is larger. This is briefly a proposition advanced and approved of by several farmers who ardently wish for an influx of population into their sparsely populated territory. The tour has been of much practical service, not only in calling attention to the value of this industry and familiarising prospective growers with its culture, but a further advantage has accrued in experience gained of the behaviour of different varieties under divergent climatic influences, which will eventuate in a better knowledge generally of the habit of the plant. My visit, covering as it did so large an area of country, was of necessity hurried, and sufficient time was not available to give the requisite investigation in certain localities. I would suggest the Department give me an early opportunity of visiting the region around Miriam Vale to Bororen, on the Rockhampton line, where some very excellent specimens of cotton were given me, and which need identification.

Three fresh varieties were observed at Capella, Clermont, and Gindie, seeds of which have been distributed among various growers, so that evidence of their value may be to hand during the coming season. In this report I have of necessity but briefly summarised interesting points of my visit, which indicate that a huge territory admirably adapted to produce the finest of cotton is now awaiting the advent of population to utilise its resources. I wish to record the valuable assistance rendered me by Mr. Lyons, secretary of the Rockhampton Pastoral and Agricultural Society, which materially helped me in my work. During this trip I travelled by vehicle 102 miles, by rail 2,207 miles, and by bicycle 225 miles, having left on 7th October and returned on 16th November.

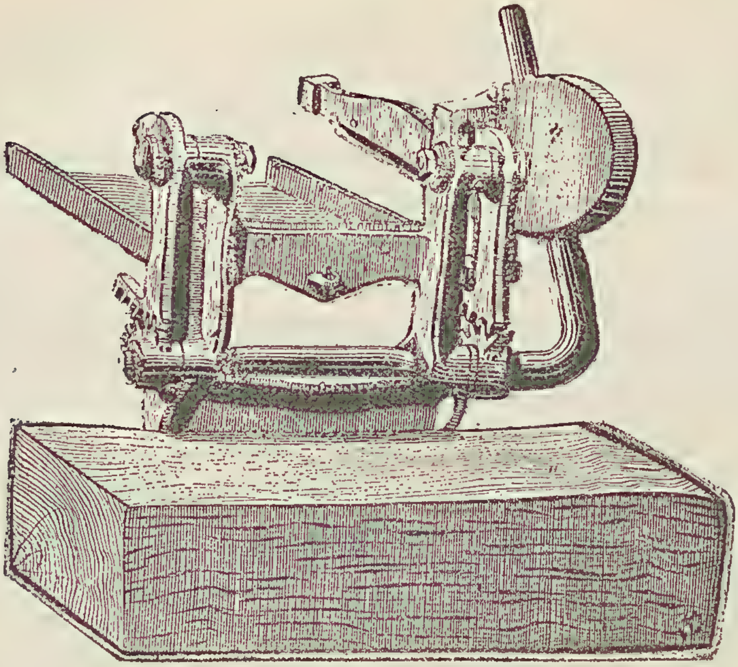
EXTRACTION OF BANANA FIBRE.

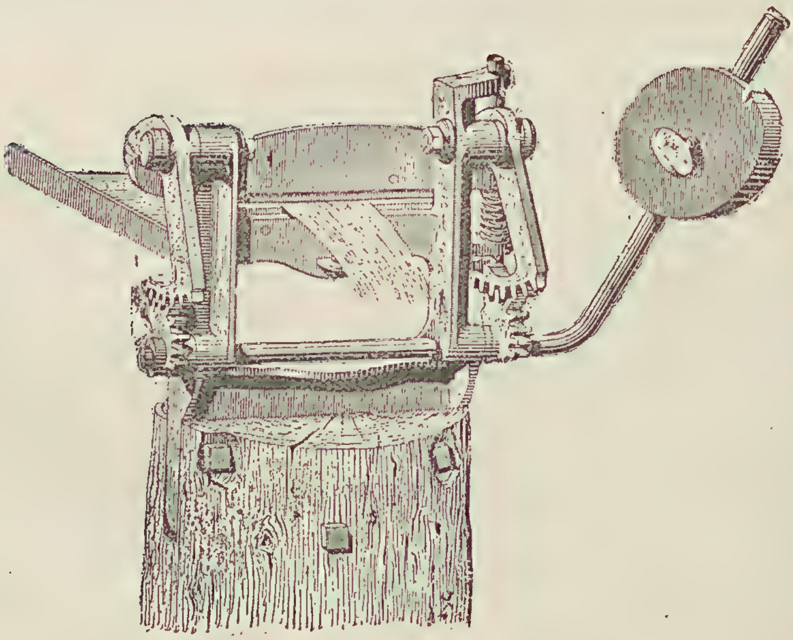
Manila hemp, which is a product of the member of the banana family known botanically as *Musa textilis*, is, so far, the only fibre extracted from the banana which forms a valuable article of commerce. But it is well known that the stem of the ordinary banana plant, such as the sugar and Cavendish bananas and the plantain, contains a large quantity of excellent fibre, which, in this country of dear labour, it will not pay to extract unless some suitable machinery is available for the purpose. Hitherto there have been no such machines on the market, and those which have claimed to be able to carry out the work expeditiously and cheaply have lamentably failed to fulfil the conditions.

A machine has lately been invented and patented in France for the extraction of banana fibre, for which the inventor claims that it will do the work to perfection, and that at a very low cost for labour. The price of the machine is only about £5, and it is said that it will turn out about 65 lb. of clean fibre in a day.

It is called "The Défibreur (Fibre Extractor) Duchemin," and is the invention of Mr. Eugene Duchemin, one of the most experienced agriculturists in Tonquin.

Whether such a machine as here illustrated could be worked to a profit in a country like Queensland, where the labour conditions are such as to prohibit the profitable working of hand-power machines, is open to question. There is no doubt that thousands of tons of valuable marketable fibre are annually left to rot on the banana plantations, when the stems are cut down after they have





borne their bunch of fruit; but as no machine has yet been invented by means of which the fibre could be expeditiously and at the same time cheaply extracted a valuable exportable product continues to be wasted, and we cannot think that

a machine such as is here described will solve the problem. During the course of the year, however, the matter will be put to a practical test, as a machine has been ordered for Captain Hamilton, a planter at the Solomon Islands, who intends to try what can be done in the way of extracting banana fibre by this means.

For the extraction of banana fibre, the installation consists of three extractors, one slicer, and one pulper, the whole costing only 112 francs (£4 13s. 4d.), and weighing 11 kilos, a little over 24 lb. To work the five machines, three men, one woman, and a boy or girl are employed, and their united efforts result in the production of 30 kilos of fibre for the day's work (65 lb). Now, if we value the best fruiting banana fibre at £20 per ton, the day's work would be worth about 11s. 7d., and, since black labour can be obtained in New Guinea and in the Solomon Islands at 4d., 3d., and 2d. a day for men, women, and boys respectively, the cost of producing 65 lb. of fibre with the machine under notice would only amount to 1s. 5d., or at most, with native food, 2s., leaving a clear profit of 9s. 7d. per day, or £2 17s. 6d. per week. At this rate it is apparent that the greater number of machines used, the greater the profit in countries where such cheap labour is available. The only way in which the machine could be profitably utilised in this State would possibly be at the aboriginal mission stations, or perhaps by the Chinese banana-growers.

It is claimed for the machine that it will extract the fibre of pineapples, Sansivieria, and aloes, as well as that of bananas.

PLANTING POSSIBILITIES IN PAPUA.

The following very interesting report on the Barodobo Plantation at Rigo, in Papua, was kindly furnished to us by Mr. A. C. English, the proprietor:—

I have much pleasure in replying to your request for particulars of the Barodobo Plantation, which is situated about 1½ mile inland from the coast at Kapa Kapa. The area is freehold property of about 226 acres. Out of this there is about 70 acres planted with rubber (*Ficus Rigo*), the indigenous rubber of this district—about 12,000 trees. The youngest trees are about four years old, and about 50 acres from about five to nine years old. In addition to this, there are about 15 acres of cocoanuts coming into bearing, 70 acres of sisal hemp, the greater part over two years old, and will soon be ready for harvesting. Experiments have been made with a few acres of Arabian and Siberian coffee; although it thrives very well during the wet season, the rainfall is not sufficient to ensure its success as a marketable product. A similar experience with cocoa. About fifty trees of the rubber *Ficus elastica* have been planted, and have ben found to thrive most vigorously, and the surrounding district is well adapted for it. Several kinds of cotton have been tried with great success. A small parcel I am forwarding from the kind known as Kidney cotton. Sea Island, China, and India varieties, also American, have grown well. Kapok also grows well. Some of the trees grown from seeds imported from Java have obtained a height of over 60 feet in nine years. The cotton has been reported upon by experts as first class. Turmeric, arrowroot, ginger, and peanuts have been grown successfully, but no attention has been paid to them. There is also one fine specimen of China tea, which seemed to thrive well. Most of the tropical fruits do well, and many are to be found on the plantation.

European vegetables, such as tomatoes, beans of all kinds, cucumbers, cabbage, radish, lettuce ,egg-plant, eschalots, beetroots, turnips, &c., all grow well during the wet season, and I am of opinion that most European vegetables will grow well on the inland river banks, and would well pay a planter to keep a garden for this purpose.

Poultry, such as fowls, geese, guinea fowls, ducks, pigeons, all thrive well. Maize during the wet season gives an abundant crop, and it is possible

to get two crops per year, thus reducing the cost of keeping poultry to a minimum. Millet and sunflower—excellent food for poultry—also grow well.

Cattle, such as oxen, goats, pigs, horses, thrive very well, fodder and food being plentiful. Sheep have been tried and bred here, but have been found to get so fat, and the wool grows so fast, that we think the heat was too much for them. Other kinds with lighter wool, such as the Java sheep, we believe, would do well.

Referring back to the rubber *Ficus Rigo* and sisal hemp, the former is a very hardy tree, thrives well, easily grown from cuttings. Numerous plants are obtained from the surrounding scrubs, where they are found in the form of parasites. Most all wild and domestic birds and animals feed on the figs, thus carrying the seeds in all directions; being passed through the bowls of birds, the seed germinates in the limbs and forks of trees. The roots find their way to the ground, eventually strangling the foster mother, and become a fine tree. There are other instances of seed having germinated at the foot of large trees after a fire or heavy rains. It is quite easy after a few acres of this valuable tree are planted to extend the area. The lower limbs usually throw aerial roots, like most of the Ficus family, and in favourable weather we have cut off these limbs with 3 and 4 inches diameter, planted them out, and soon have become trees which would take two or three years to obtain the same dimensions as if planted from ordinary cuttings. Seed has been planted, but we have been unable to get it to germinate. In several cases we have taken limbs with roots from trees which have soon outgrown in size the tree they were originally cut from, as shown to you while inspecting a portion of the plantation.

I would strongly recommend the would-be settler to pay some attention to this hardy tree, which seems to be able to survive the severest drought that I have known for the last twenty-four years. It grows well in the different soils from high-water mark, the edges of salt and clay pans, open forest, and scrub country, and may be found growing on almost bare rock, and gives a reasonable return after six years—about 3 lb. of rubber per tree. For experimental purposes, from a full-grown tree with a diameter of 2½ feet, I got the natives to bleed it for all it was worth, and obtained 7 lb. weight of marketable rubber from the tree, which is still on the plantation.

The rubber from the *Ficus Rigo*—which I first brought under notice and placed on the market in London some twelve years ago—was reported on by Silver and Co. as being on a base of Pará rubber, and the same class of rubber has been sold in Sydney this year at 4s. 4d. per lb.

SISAL HEMP.

This has been experimented with and given excellent results. Whatever is in the soil or climate that is so beneficial to the hemp, I am unable to say. The idea that sisal hemp will not do well in Papua is a mistaken one. No doubt there are places where the soil is too rich or the rainfall too great to ensure its success. The poling of the plants takes place much sooner here than in other places. The first experiment I made from six plants about three years old; 380 leaves were cut, an average of 64 leaves to each plant. The average weight of each leaf was 2¼ lb., or 872 lb. for the 380 leaves. From forty of these leaves 3 lb. of dressed fibre can be obtained. An acre planted with hemp at 8 feet apart gives 680 plants to the acre. At three years old these will give an average of 64 leaves per plant, or 43,520 leaves in all, which will give 3,664 lb. of marketable fibre.

A second experiment, from two plants just three years old, and which suffered a good deal from the drought: At the age of eighteen months I cut off all the suitable leaves and obtained 3 lb. 13 oz. of fibre from them; on the third year I again cut off all leaves, and obtained 4 lb. 4 oz. from the two plants. These plants were a fair average from 1½ acre.

Sisal hemp appears to grow well all along the coast line in this division and for about 10 miles inland. It is being tried about 21 miles inland, but found to grow slowly. I am forwarding the made fibre on to you, the results of the two plants, which are still growing here.

GENERAL.

With regard to the possibilities and development of this division in an agricultural and pastoral point of view, I consider it has a great future. There are very large areas of the finest agricultural land to be found here, that are most suitable for propagation of tropical economic industries—in many places from the sea level. The hill country is too steep for European planters. There is no reason why this should not be left to the natives, they preferring the steep hillsides for gardening purposes.

I have no doubt the many economic plants, &c., that grow throughout the Malay States and Java will do equally as well in the territory of Papua, and I consider that Papua has many advantages, as most any climate may be found in the Alpine regions.

The river banks, valleys, and plains are very fertile and productive. It is a thousand pities to see the wholesale destruction of these valuable scrubs and lands by the natives through their primitive and rotten way of agriculture. They now run all over the country selecting the best and easiest spots for forming what is known here as a garden, regardless of blocking up roads, waterways, and channels, besides encroaching on lands they have no more right to than I have. One of the worst evils arising from this is the rapid spread of noxious weeds of the worst kinds, which must be put a stop to, and natives as well as Europeans compelled by law to keep such out of their plantations.

FORESTRY.

With regard to timbers, we have some of the finest to be found in the way of hardwoods and fancy-grain woods, suitable for cabinet and turning purposes—pines, cedars, oaks, casuarina, and many other fine timbers, of which little or nothing is known, are to be had here. I personally am well acquainted with the native names of many. Some of the hardwood piles placed in the ground as Dubu posts have been there for over 100 years, and are still sound. Some few years ago I took a block of this wood to England, where it was reported on by experts, and valued at 2s. per foot cube. Two other woods—Marava and Diaroa—I have known to be in the sea for the last twenty-four years and not affected by the marine worm.

I am of a strong opinion that it would well pay the Commonwealth Government to institute in Papua an agricultural department—a native labour bureau—also to appoint a forest ranger and a native protector.

PASTORAL.

There is a great extent of good cattle country in the Rigo district—rolling downs and plains, with good grass, and, in ordinary seasons, is well watered by numerous creeks, with light belts of good scrub land on the banks, and with an overshoot dam here and there. No difficulty would be experienced in obtaining water; besides, there are the two large rivers running through the land. The area of this land is about 60 miles by 25 miles. Another fine valley worthy of mention is that known as the Keyfri Valley Goldfield, at the end of this division. It is at an altitude of 2,000 feet, with a most desirable climate, and only three days' walk from the coast. The area is about 15 miles by 10 miles, and is well watered by the head of the Musa River. A good road is possible to the valley, with a good shipping port and landing. In both of these prospective pasture belts there is a good supply of timber for fencing purposes, of the Eucalyptus family.

Through the first-mentioned block, there are good bridle tracks, and the natives are well under control. It carries a big population, and a settler would be as safe amongst them as he would be in many of the big European cities.

Many years ago a good bridle track was cut for 91 miles to the top of Mount Obru, in the Main Range, which I consider one of the most practical to the interior, and it is quite possible to make a dray road from the coast at Kapa Kapa to the fertile valley of the Kemp Welch River. Rigo is the key to the many inland tribes so well known to the Government, and there is far more native traffic on the road here than any other road of its length in the possession. You asked me when here what was to become of the improvements made at this place when the Rigo Station is removed. I can only answer in the negative, "It must be sadly neglected." It is one of the deepest regrets to me and others that I understand the station is to be removed, and, if allowed to take place, is, in my opinion, one of the worst political blunders that could possibly happen.

NEW FIBRE PLANT—THE ZAPUPE.

A full description of the zapupe fibre plant, for which we were indebted to the courtesy of Mr. W. B. Murray, editor of the "Mexican Investor," appeared in our December number, 1906, and we refer our readers to that journal for all particulars concerning what now appears to be the most valuable fibre plant yet discovered. From the October issue (1907) of the "Investor" we take the following:—

Zapupe culture continues to be a field of large investment for many capitalists of this city, and also for many investors from different parts of the United States. Within the past month there have been no less than six large concerns, two of which are located in New York and one in Kansas City, that have sent their representatives here to look carefully into the question of zapupe culture.

The statement of these representatives, after their investigations were completed and when they were on the eve of departure to make their reports, has invariably been that they saw a great future ahead for the industry of raising zapupe and handling the fibre.

Deals in land suitable for raising the fibre plant have been made to the number of three, and it is shown that several others are pending. With these there is a strong suspicion that other deals have been put through on the quiet by parties who wanted to get everything ready before anything leaked out about their movements.

Samples of the wonderful fibre plant which have been submitted for examination and analysis to experts in New York have served to bring back the most glowing reports. The experts say the zapupe fibre is far superior to henequen fibre, can be used in the manufacture of a much finer grade of material, and as such will command a good deal higher price.

The nature of the plant has many things to recommend it to the planter. It is very hardy, runs little danger from the depredations of stock, matures quickly, and lasts for five years; is not dependent to any extent on climatic conditions or moisture, and the fibre is extracted from the leaves with economy and speed.

There are several grades of zapupe, and planters have not as yet come to an agreement as to which is the best. The industry is in its infancy as yet, and many things are still open for argument.

If henequen made so many millionaires in Yucatan and Campeche, it seems certain that more will be made by zapupe in Tamaulipas and Veracruz. Planting at present is more in the northern part of Veracruz, though there are large tracts set out in Southern Tamaulipas as well.

A New York company has been formed to go into zapupe planting on a large scale, and the "Investor" on this point says:—

C. H. Barkley, who was here (Tampico) some time last summer in connection with an accountant's investigation, and at that time became well known here, has become interested in the zapupe business of this section, and, with the able assistance of M. Poindexter, of this city, will form a company in New York to carry on an extensive planting business. Mr. Barkley is a resident of New York, and is said to have a large acquaintance among Wall-street capitalists.

Much planting has already been done in this section, probably 500,000 plants having already been set out. Another year, it is believed, will see this number more than quadrupled. Within five years Tampico should be a great fibre exporting port. Measures are now being taken to get in stock hundreds of thousands of the young zapupe scions for planting. The available number of these is now somewhat limited, but this is only a temporary difficulty.

GROWTH AND EXAMINATION OF SEEDLING CANE.

For many years past seedling canes have been raised in quantities as large as the trial grounds at St. Clair would allow, and several good varieties have been secured. Looking back, however, at the methods hitherto adopted in growing and testing these canes, a conclusion has been arrived at which it is anticipated will considerably lessen the expense of future experiments. The practice at first adopted was to grow seedlings, and to test the most likely canes for sugar content at the end of the first year's growth. Those passing the test were again planted, again tested, and a certain number retained for a third year's growth, when they were again chemically examined, and so on for five or six succeeding years. In the end, if three or four good new canes were secured, the work was considered satisfactory. On summing up the expenditure of time and money, however, it was found to be a very serious item in the annual upkeep of the experiment, and, realising this, the following system has now been adopted for the St Clair experiments:—

It has been assumed that the first quality in a cane is its ability to give a heavy yield; second, to ratoon well; third, to stand adverse seasons, wet or dry; fourth, to grow well on various soils, and have plenty of vitality—*i.e.*, grows quickly from cuttings or tops; and fifth, to be immune to the attack of disease.

No matter how high the sugar content may be, no matter what its milling capacity may be, if it cannot pass the cultivator's test for weight per acre it must evidently be finally discarded. Therefore, unless a cane is first tested for yield per acre, it is clearly logical to conclude that it is useless to test it for other qualities, as it wants a primary essential quality demanded by the cultivator. On this ground our experiment has for the past two years been carried on, "in inverse order" to the course adopted when the experiment was first started. To completely invert the process would naturally be wrong, as it might be found at the end of the course that the only canes left were those which must of necessity be condemned for their want of saccharine contents, and therefore it would be advisable to commence examination for saccharine contents at, say, the fourth or fifth year. Some may say that there is no difference between the two methods. It is, however, clearly to be seen that by the inverted method the cultivator's test is taken first, and therefore a far less

amount of chemical work has to be performed, especially in the first stages. It is, of course, known that under the first system many canes were condemned the first year, owing to their not showing field characters; but it is also a fact that ninety-nine hundredths of those which were chemically examined fell out in after years, and probably after several examinations, and the work on them was therefore lost. Under the new system this continuous chemical examination would be entirely avoided until the fourth or fifth year of trial, when it would be used to detect and root out all canes of low sugar content, when, instead of hundreds, the canes to be examined would probably be counted by dozens, and exactly the same end will have been attained.

It is, of course, quite evident that it will be useless to report on canes until they arrive at the five years' stage, as it would amount merely to the enumeration of the canes cut out and the number left on the field—in fact, a record of the survival of the fittest.

The canes left standing after the first field examination would be tested the second season for vitality from cuttings; the third season as 1st ratoons; the fourth as 2nd ratoons, and immunity from disease, as it has been noticed that ratoons will always show a tendency to disease quicker than canes with greater vitality; and again as "plants" the fifth season, when chemical examination could begin with advantage, as it would be commenced on a set of canes which have already stood a series of tests, and from which set little or no further cutting out would be necessary, except on the ground of chemical selection, to finally decide which are to be retained and which rejected for field cultivation.

Chemical tests "cannot tell us whether canes have vitality, whether they are immune from disease, whether they will ratoon well, or whether they will stand drought or wet seasons," and these qualities, therefore, may more conveniently be tested first without waiting for analytical results; but the latter are, of course, essential in order to assure the planter that the cane he is growing has a certain sugar value—in fact, prove to the growers that good canes have been found—and to give a definite value to each.—"Trinidad Botanical Bulletin."

LANDOLPHIA RUBBER VINES.

Mr. Jas. Pink, "The Badgeus," Wellington Point, writes:—I note that in this month's (November) Journal you are calling attention to rubber vines (Landolphia), in which I once took great interest.

When I was in charge of the Botanic Gardens, I obtained a collection of these plants from the Royal Gardens, Kew, which I planted out for purposes of propagation. I felt sure that these plants, when they became better known, would be valuable for Northern Queensland. Allow me to congratulate you on being the first to call attention to the value of these plants.

VIEWS AT THE STATE NURSERY, KAMERUNGA, NORTH QUEENSLAND.

Some time ago we received from the manager of the Kamerunga State Nursery, who is also the Instructor in Tropical Agriculture, a series of views taken at the Nursery. We regret that, owing to the illness of Mr. Newport, we are unable to give particulars concerning their growth, production, treatment, &c., but we hope to do so when Mr. Newport returns from Ceylon, whither he has gone for some months to recuperate after his severe illness.

The Red Cedar is an indigenous tree which is common to the entire coast of Queensland. Forty years ago large quantities of this timber used to be cut in the scrubs which then occupied large areas of the Logan and Albert

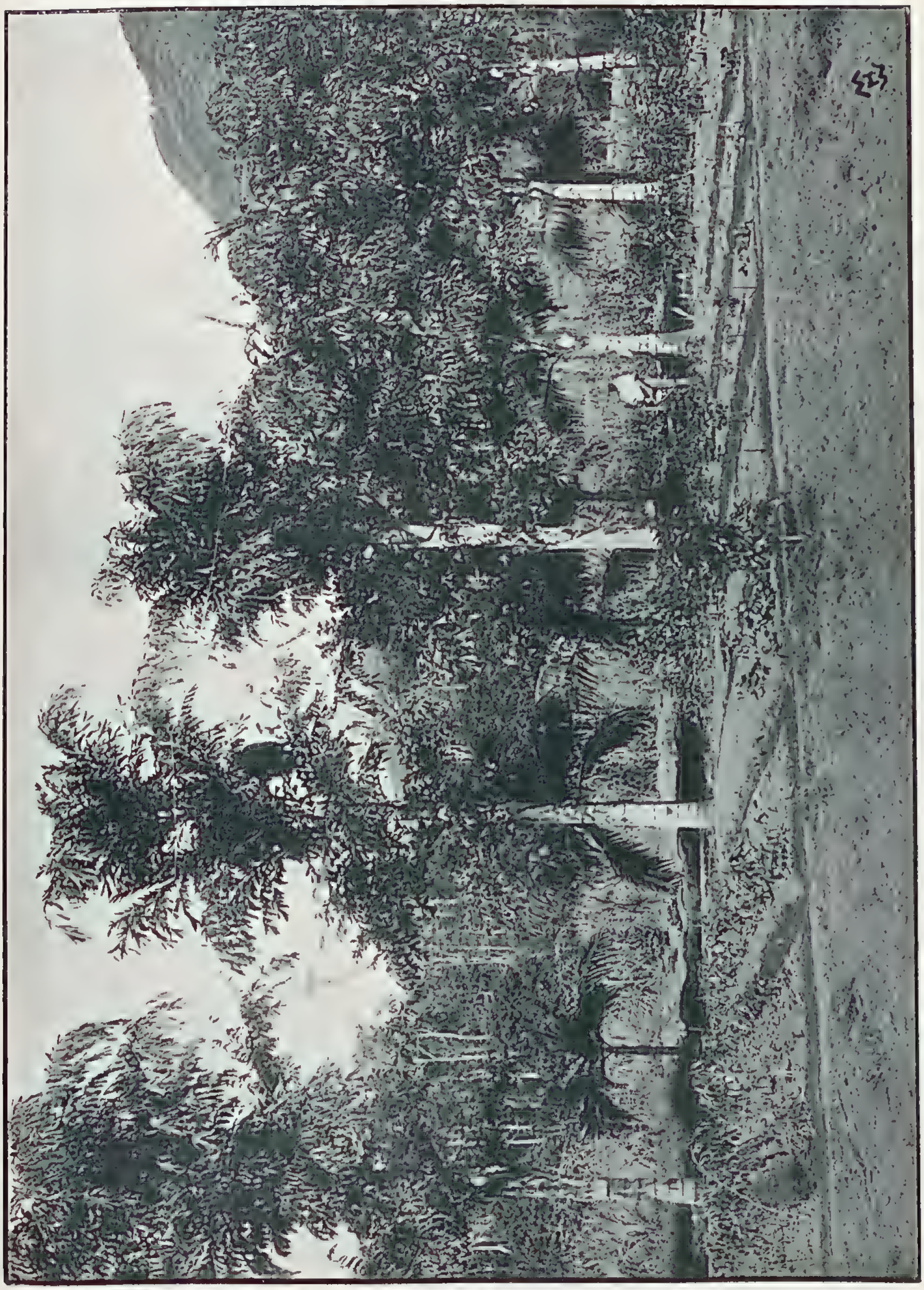
Plate I.

West African Oil Palms at Kamerunga State Nursery, N.Q.

Plate II.

Palms and Agaves at Kamerunga State Nursery, N.Q.

Plate III.



Bastard Sago Palms at Kamerunga State Nursery, N.Q. Red Areca Palms in the Background.

Plate IV.

Red Cedar Growing in the Open at Kamerunga State Nursery, N.Q.

districts. To-day the trade in cedar is practically confined to the scrubs of the far North.

The palms shown in another illustration are *Cocos plumosa* and *Archonophœnix Alexandrœa,* both to be seen in Southern gardens. The agaves in the foreground are representatives of the *Agave rigida,* var. *sisalana,* which produce the valuable sisal hemp of commerce. The third illustration gives a very good idea of the West African oil palm, so well described in the December number of this Journal, 1897, by the late Mr. E. Cowley, who was then manager of the Kamerunga Nursery. It is a native of Guinea, and the best palm wine is made from it. A well-developed cluster of fruit spike may attain a weight of 40 lb., bearing upwards of 800 nuts the size of a walnut. The outer portion of the fruit, almost of lard-like consistency, yields, through boiling, the commercial oil for soap and candle manufacture. The plants here depicted were imported by the Department of Agriculture from Sierra Leone in 1890. Out of 20 plants 8 only survived the voyage. In 1896 two fruited. In 1897 thirty fruits appeared. Each nut weighed about half an ounce, and an entire spadix weighed 5 lb., which gives about 160 nuts to the bunch. The kernels are also used for oil production, and are worth about £17 per ton.

The sago palm, as its name implies, is that from which the sago of commerce is obtained. It is indigenous in Papua, where it constitutes an article of trade between different portions of the possession.

The areca palm-tree bears nuts also used for oil-making purposes.

ANT EXTERMINATION.

For the extirpation of ants the following remedies are good. To be effective they require attention and perseverance. It is well to find their main burrow or nest, if possible. Arsenic is sure destruction to them, but it is dangerous to handle.

Air-slaked lime plentifully dusted in warm dry weather over and around the hills, or in the house or other places infested, will cause the ants to vacate them in a short time.

Snuff: Dust a little snuff upon the floor of the rooms or pantry.

Draw a thick chalk line around a smooth tree or across an upright board or post and they will not pass over it.

Camphor: Put a piece of camphor, the size of a filbert nut, into 2 quarts of hot water. When cold apply to pot and other plants, and the insects will be driven off without injury to the plants.

Mix together 1 part of calomel and 10 parts of finely powdered white sugar, and lay it in little heaps about their nests and runs. The ants will eat it and die.

Coal oil, mixed with six times its bulk of water, sprinkled over the nests every few days, will kill and drive them away.

Pans or saucers, nearly filled with honey or sweet oil, attract ants, and they are drowned in it.

Flowers of sulphur, ½-lb.; potash, 4 oz. Set in an earthen vessel over the fire until dissolved and united. Afterwards beat to a powder. Infuse a little of the powder in water and sprinkle in places infested with ants.

To Destroy Black Ants: A few leaves of green wormwood scattered among the haunts of black ants will drive them away.

Red Ants: Powdered borax sprinkled around will exterminate both red and black ants.

Make holes in the ant hills, 6 inches deep and 1 foot apart, with an iron or zinc tube fitted with a wooden stake. Withdraw the stake. Pour 1 tablespoonful of bisulphide of carbon down the tube. Withdraw the tube and stop the hole immediately. Bisulphide of carbon is very inflammable.

Entomology.

THE PUMPKIN BEETLE.

Farmers and market gardeners have for the last three months suffered considerable losses by the depredations of a beetle popularly known as the pumpkin beetle, which has been devastating the leaves and flowers of pumpkins, marrows, and cucumbers. In response to a request for some information on the habits of the insect, and on how to destroy or repel it, Mr. H. Tryon, Entomologist and Vegetable Pathologist to the Department of Agriculture and Stock, supplies the following notes:—

THE GALERNCA OF THE PUMPKIN, &c. (*Aulacophora Olivieri*, Baly).

The beetles submitted as being concerned in serious depredations in your vegetable garden is one brought under public notice by me in October, 1889, the name Banded Galernca being then assigned to it, in allusion to the fact that it belonged to the group of plant-eating beetles, named *Galerncidæ*. At the same time a plain-coloured species, of similar habits, was described, named the Brown Galernca [*vide* Tryon (H.): "Insect and Fungus Pests," 8to, Ed., 1889, p. 173]. Since then I have written concerning it and its depredations on several occasions. The following is the text of an article headed "Banded Galernca—Pumpkin Beetle," that was thus contributed to the "Daily Mail" of 30th October, 1903:—

The insect concerned in these depredations is one that not only attacks the cucumber plant, but is also partial to the foliage and tender organs—flowers especially—of the different varieties of pumpkins and melons. This is an orange-coloured beetle of an oblong form, measuring about ¼-in. in length, and rendered conspicuous by the presence of two broad black bands crossing the wing covers, the posterior of which bands is interrupted in the middle. Although popularly styled a ladybird, it is not a member of that (the *Coccinellidæ*) family of beetles. It may, therefore, be most appropriately designated the Banded Galernca, to distinguish it from the Plain-coloured Galernca, a beetle of analogous habits and having the same host plants. The entomologist terms it *Aulacophora Olivieri*, Baly. Unlike many of our plant destroyers, it is an indigenous insect, and, therefore, not derived from some foreign source.

With regard to the phases of the life history of the insect, it may be mentioned that those represented by the egg, the larva, or grub, and the pupa or dormant state, are passed beneath the surface in the soil, but not necessarily in that forming the location in which the plant injured is being grown. [*Note.*—In the case of the true leaf-eating ladybirds, *Epilachna* spp., on the other hand, all these stages of their existence are passed above ground in the plant victimised.]

When, however, injury to a plant or plot of plants of the kinds favoured is of long continuance, there are grounds for concluding that the beetles implicated latterly are of quite local origin, being apparently the progeny of the beetles that had occasioned the damage when this was first experienced.

The Galernca, passing, as we have seen, much of its life in obscurity, can alone be directly assailed when it has arrived at the perfect or beetle condition. The measures that are then available for coping with it may be distributed in two classes—(1) Repellents and (2) destroyers.

1. *Repellents.*—The Banded Galernca, although endowed with a voracious appetite, usually declines to consume foliage that has become soiled. Accordingly, the plants may be more or less protected by dusting upon them, the foliage especially, fine wood ashes and air-slaked lime, or plaster of Paris, and especially if these substances have had a few drops of carbolic acid or kerosene previously added to them, with simultaneous stirring, to enable the odour of these bodies to generally pervade them. A powder formerly on the Brisbane

market, named "Iguano—Insecticide Manure," has proved to be in a certain degree serviceable in this connection when exhibited in the way proposed. [*Note.*—This substance is now known as "Vaporite Strawson," and put up by Messrs. Strawsons, of England.]

2. *Poisons.*—But the plant may likewise be protected by poisoning the insects that light upon them by the application of some reagent containing arsenic—*e.g.*, arsenite of lime, arsenate of lead, London purple or Paris green. Of these, Paris green (Blundell and Spence's) is the one most readily obtainable and most simple to administer, but, of course, it must be used subject to the observance of the safeguards prescribed by the party furnishing it. This insecticide may be applied to the plants in two different ways—(1) In the dry state as diluted powder and (2) as forming an ingredient in a liquid. In the former case it may be incorporated with such substances as flour (inferior quality), plaster of Paris, or air-slaked lime. In thus diluting the Paris green, and to secure that equal bulks of the different mixtures will contain approximately the same quantity, it will be necessary to use twice the amount by weight of plaster of Paris as of flour, and the lime in intermediate proportionate quantity—*e.g.*, 1 lb. of Paris green to 100 lb. of plaster of Paris, or 50 lb. of flour. It must not, too, be overlooked that the obtainment of a perfectly uniform mixture is not easy of accomplishment, and requires perseverance (and it can only be suitably prepared when made immediately prior to use).

The Paris green may be otherwise administered in suspension in water, by adding it (after first forming a paste with the powder, as in making paint) at the rate of ½-oz. to every 4 gallons of water (one kerosene tin full). Lime in about equal weight to that of the insecticide named should also be comprised in the wash, as well as a few spoonfuls of molasses. Used in a dry form the mixture containing the poison should be tied in a piece of fabric of open texture to a stick and thus dusted upon the plants, the operator always working in the early morning, before the dew has risen, and with the wind to his back.

In the liquid form it must be applied with the aid of a spray-pump, the wash being kept well stirred whilst in use in order to keep the Paris green in suspension in it.

With regard to these two methods of procedure in using the insect poison, it may be remarked that the latter is more economical as well as the more efficacious of them.

Mr. Voller, formerly in the service of the Agricultural Department, testifies that he has found the following mixture useful in protecting cucurbitaceous and other plants from the attacks of leaf-eating insects:—Boil together 1 lb. of soda and 1 lb. of resin in 1 gallon of water, and when incorporation has been brought about add this to 5 gallons of warm water, a few parings of soap being first dissolved therein to facilitate passage through the spray-pump.

Whether repellent or insecticide be resorted to it is, of course, to be borne in mind that only the parts of the plant on which the substances used repose are protected. Accordingly, therefore, renewed applications are necessary as growth proceeds. Again, early attention to the presence of the pest is called for. In the case of this injurious insect there should be no such thing as a negligible quantity. Oftentimes, if young plants, whether of cucumber, pumpkin, or melon, are freed from time to time from the few insects of the kind under notice that attack them by hand-picking alone, a simple and practicable procedure, their subsequent soundness is secured, as it is commonly these that, left to themselves, form a starting point for a second generation of insects of greatly augmented numerical strength, and thus give rise to the serious damage to the crops and subsequent loss to its proprietor so commonly made a matter of complaint.

A rotation of crops providing for the temporary absences of those yielded by plants of the cucurbitaceous order (cucumber, melon, pumpkin, &c.), to which the present insect is so partial, will serve, moreover, in some instances in banishing the Galernca from a farm at least for a while.

Animal Pathology.

TICK FEVER IN CATTLE.

TECHNIQUE OF THE METHOD OF PREVENTIVE INOCULATION.

(REVISED EDITION)—1907.

BY C. J. POUND, F.R.M.S., Government Bacteriologist.

The method of immunising cattle against tick fever (*Piroplasmosis*) by injecting into the susceptible animal a definite quantity of defibrinated blood from a recovered animal has proved most successful in those countries where the disease has become endemic. The initiation of this method was associated with an exhaustive series of crucially conducted experiments, which took place at Indooroopilly, Mundoolan, and Inkerman in the early part of the year 1897. Since then this scheme has received the staunchest support from such eminent authorities as Professor Koch, Drs. Eddington, Theiler, and Hutcheon, in South Africa; and Drs. Francis, Connoway, Salmon, Melvin, Schroeder, and Mohler, in the United States of America. Further, as a result of the numerous researches of these scientists, the stock-breeders in the tick fever States of North America, the Argentine, Cape Colony, the Transvaal, and Rhodesia are all more or less having their cattle protected—particularly those that are bred in clean districts and sent into fevered country.

There can be no doubt, whatever, as to the practicability of this method. For several years now the annual and special reports that are issued from the Agricultural Department of those countries where tick fever obtains, emphasize the highly satisfactory results obtained by inoculation, and strongly recommend its general adoption. Stockowners in North Queensland know only too well that the losses among unprotected stud cattle coming from clean country in the Southern States amount to nearly 100 per cent.; whereas amongst those animals that have recovered from inoculation fever the mortality is more often less than 2 per cent.

NECESSARY APPLIANCES.

By carefully considering the following directions, anyone accustomed to work among cattle may be able to perform the necessary operations without personal instructions. The operator must be provided with the following necessary appliances:—

1. Six feet of whipcord.
2. Trocar and canula. The latter should not be less than ⅛-inch diameter.
3. Syringe to hold 10 c.c., fitted with about 3 inches of thick-walled rubber tubing, and one or two of the improved needles.
4. Two large wide-mouthed jars or jugs, to hold about 1½ pint each.
5. Two small wide-mouthed bottles, to hold about 2 oz. each.
6. Twenty to thirty fowl-wing feathers, previously washed in cyllin solution, 1 in 400, then in clean water, and finally dried in the sun.
7. Several pieces of clean linen or calico.
8. Clinical thermometer.
9. *Note.*—For the inoculation of large herds of ordinary station or wild cattle in a crush, some additional appliances are found to be absolutely necessary. At first a by-way tap was used, but, in consequence of the possibility of so many errors occurring through the operator turning the tap the wrong way, this accessory has been superseded by a specially designed double-action valve made in two separate pieces. The larger part A, with two nozzles, is fitted on

to the front of the syringe; to the upper or long nozzle is attached some 10 or 12 feet of thick-walled (small aperture) rubber tubing; at the other end of this tubing is fixed the inoculating needle. To the smaller or lower nozzle is attached about 30 inches of the same kind of tubing, the opposite end of which is fixed on to the smaller part B, which is placed in an upright position at the bottom of a small sodawater bottle, which is kept in the trousers-pocket of the operator in charge of the syringe.

10. In previous editions of this pamphlet a 1-20 carbolic acid solution was recommended for disinfecting purposes. This has been superseded by a new product known as cyllin, which possesses a high germicidal efficiency ranging from 10 to 30 times that of carbolic acid, and which for the higher forms of animal life is at least 10 times less poisonous. Further, it has no corrosive action on the skin.

    As an antiseptic for washing instruments or the skin of the animal to be operated upon, cyllin disinfectant may be employed in the diluted form of 1 in 400. For general purposes this standard solution may be made by adding one teaspoonful of the strong cyllin to 5 pints of water, and afterwards well shaking to form a milky-looking mixture.

METHOD OF PREPARING CALVES FOR THE SUPPLY OF IMMUNE BLOOD.

Although the actual method of drawing the blood and injecting the same into animals to be protected has not been improved upon, still, in addition to the various improvements in the inoculating instruments, there have also been several modifications in the method of rendering the blood of animals suitable for general inoculation purposes.

The number of calves required to supply blood naturally depends in a great measure on the size of the herd, or, in fact, the number of animals to be inoculated. Experience has shown that twelve yearling heifers will provide sufficient blood to inoculate a herd of 20,000 cattle; while it is recorded that 8,000 and even 10,000 cattle have all been efficiently inoculated with the blood from only four animals. For general inoculating purposes, the blood of an animal artificially inoculated is to be preferred to that from an animal recovered from natural Tick Fever, the mode of operation being as follows:—Procure the desired number of healthy yearling calves (heifers, if possible), and a supply of freshly drawn defibrinated blood from a naturally recovered animal. The best way of operating is to throw each calf on its left side; the legs may be either tied or held by an assistant; the head is covered with a bag, which makes the animal lie quieter than it otherwise would do. By means of the piece of whipcord which is placed round the base of the animal's neck with a running noose, the right jugular vein is compressed so that in a few minutes it becomes dilated or swollen by the blood coming from the animal's head. A very necessary precaution will be to flatten the hair on the skin covering the vein with a little solution of 1 in 20 carbolic acid; this removes any danger of introducing foreign matter which might produce blood-poisoning or an abscess under the skin. The calf is lying on the ground with its feet from the operator, who, standing behind, lays his left hand on the neck and gently holds the swollen vein in a steady position between the forefinger and thumb close up to the cord to prevent the vein from shifting laterally. He then takes the improved needle in his right hand, and steadily pierces the skin into the vein. If the vein has been pierced successfully, blood will spurt out. An assistant then hands the operator the syringe filled with 10 c.c. of the recovered tick-fever blood. The nozzle of the syringe is then immediately connected with the needle by means of a small piece of rubber tubing in such a manner that there is an uninterrupted column of blood from the vein to the end of the piston-rod

of the syringe; for the fact must not be overlooked that a small bubble of air injected into the bloodvessel may cause instant death of the animal. Directly the syringe is coupled with the needle the cord is removed from the neck, and the blood ejected from the syringe into the vein. It is advisable on withdrawing the needle to pinch the skin round the wound and apply a little more carbolic solution before releasing the animal. After each calf has been inoculated, they should be kept in a well-grassed paddock with plenty of fresh water, and their temperatures taken regularly night and morning from the eighth to the twenty-fourth day after inoculation. Those giving a very decided reaction—viz., temperature rising from the normal (101·5 degrees Fahr.) to 106 degrees Fahr. or higher—are, when they have completely recovered (which will be within six weeks), suitable subjects for drawing blood from for general inoculation purposes, and are generally spoken of as "immune calves." The reasons why young animals are preferred are:—(1) They are easily handled and managed. (2) The subcutaneous tissue of the neck between the jugular vein and the skin is not very thick. (3) In inoculating blood from a calf there is very little risk of introducing tuberculosis, which is seldom found in calves; however, in order to minimise any possible risk from this disease, the calves can be all previously tested with tuberculin.

METHOD OF DRAWING THE BLOOD FROM THE IMMUNE CALF AND PREPARING SAME FOR GENERAL INOCULATION PURPOSES.

The immune calf is thrown on its left side, and a cord tightened round the neck as previously described, but instead of a needle the operator takes the trocar (with canula attached) in his right hand, and with it in a vertical position steadily pierces the skin into the vein. Immediately the point is through the wall of the bloodvessel, the instrument is held in a slanting position and gently pressed further into the distended vein. The operator then withdraws the trocar with the right hand, the while holding the sheath or canula with his left, and keeping it well into the bloodvessel. If the vein has been successfully pierced, blood will flow copiously. If it does not flow, the operator returns the trocar into the sheath and gently withdraws both of them a very slight distance but not out of the wound, because at the first insertion the trocar may have been forced through the vein or on one side of it, which often happens in the case of young thick-necked bulls. However, as soon as the blood flows freely on withdrawal of the trocar it is caught in a perfectly clean wide-mouthed bottle. From an animal six months old half a pint of blood may be taken, and as much as a pint and a-half from a yearling. In the summer time, when the flies are plentiful, a little tar should be placed on the wound before the calf is released. As soon as the requisite amount of blood is drawn, it should be well stirred for about five minutes with a whisk formed of half a dozen wing feathers from a duck or fowl. At the end of that time the whisk, when lifted out, will be found to be covered with stringy-like fibrinous blood-stained matter. This is the fibrin, and its removal prevents the blood thickening, clotting, or coagulating. The process of whisking and removing the fibrin is known as defibrination. Defibrinated blood is that which has been so treated. The blood is afterwards strained through a piece of clean linen or calico into another clean bottle, and is ready for use.

DETAILS OF THE PROCESS OF INOCULATION.

Allowing 5 c.c., which is equal to one teaspoonful, for one bullock, one pint of defibrinated blood would be adequate to inoculate about 100 cattle. To minimise, as fas as possible, the risk of contamination, the following precaution may be adopted:—The operator puts about 2 oz. of blood from the stock bottle into a small wide-mouthed bottle, which is covered with clean linen or calico. The small bottle is for actual work of inoculation, and should be filled up as required.

Inoculation should be performed without delay. Ordinary station cattle to be inoculated should be placed in a crush, and as many as possible at a time, so that the work may be carried on quickly. Dairy cattle may be secured in a bail; while young calves may be held against the rails in a stockyard. The syringe now comes into use, and a word or two of description here may be useful. It is in principle like a squirt or garden syringe, but should have the very latest improvements. The cylinder or barrel should be made of stout glass to hold 10 c.c., with metal protecting sides, on each of which is fixed either a metal ring or a projecting piece to enable the operator to inject the blood with one hand. The plunger on the piston-rod should be made of rubber. In the latest form of syringe there is a very ingenious device for tightening or slackening the rubber washer of the piston-rod without removing the latter from the cylinder. On the glass cylinder of some kinds and on the piston-rod of others (the latter preferred), there will be noticed a row of figures, each one above a transverse line. The space between each line indicated is 1 c.c. (cubic centimetre)—that is to say, when the piston-rod has been withdrawn until the figure 4 is visible, there will be 4 cubic centimetres of space in the cylinder of the syringe. On the piston-rod of all modern syringes there is also a little set-screw, which can be screwed up and down to any part of the rod; therefore, if the syringe is first filled with blood and the set-screw turned down to the figure 5, only 5 cubic centimetres of blood can be injected. The above description only refers to syringes having the figures 1 to 10 on the piston-rod reading from the handle to the rubber plunger. With each syringe there is usually supplied one or more hollow needles, each having a metal socket which fits on to the nozzle-point of the metal protector of the glass cylinder. As the animals shrink and move suddenly from the needle when thrust into them, it is very apt to get broken owing to its being rigidly attached to the syringe, and on account of its very thin wall with large aperture, which is liable to become clogged when passing through the skin; consequently another needle has been designed. The improved needle has a smaller aperture with thick wall, thus enabling the point to be sharpened on an oilstone like a lancet. The needle is fixed in a small metal handle with depressions on either side for the thumb and finger and a circular shield in front which enables the operator to have a firmer grasp. Instead of being fixed rigidly on the syringe, it is connected by means of about 2 inches of thick-walled indiarubber tube, one end of which fits on to the nozzle of the syringe, while the other is attached to the handle of the needle, thus giving free play to the syringe when blood is being injected into an animal, and the operator has more freedom in using it. The tubing should be three-eighths of an inch in diameter, and the walls so thick that the aperture is only one-sixteenth of an inch in diameter Thick tubing does not kink and stop the flow of blood, even when turned at right angles. The instrument, having been made ready by fitting on the tube and needle, is filled with blood from the small bottle, and the set-screw fixed at the figure 5. As explained above, the inoculation of calves for subsequent supply of blood takes place direct into the jugular vein, but this process could not be carried out in inoculating cattle generally as a preventive against Tick Fever. However, the following is the method in use at the present time, and wherever adopted has given satisfactory results:—A little fold of loose skin behind the shoulder of the animal to be inoculated is lifted from the ribs with the left hand. The needle, with the flattened edge outward, is then plungd with a sudden thrust obliquely about an inch through the skin into the loose or subcutaneous tissue; thereafter the piston is pressed very slowly down, and the blood forced into the animal. Although practical experience has proved that behind the shoulder is the most favourable site for the inoculation, it may be accomplished, when necessity arises, in any other part of the body where the skin is loose. But animals should not be inoculated in the tail, the reasons being, in the first place, that the tail is exceedingly sensitive, and the needle is more apt to get broken in it than in any other portion of the body; and, in the second place,

that it is impossible to introduce the required amount of blood. The blood having been transferred from the syringe to the beast, the operation is complete. It is not necessary to take the temperatures of the animals afterwards, as if proper blood is used the inoculation seldom fails.

SPECIAL NOTES ON THE INSTRUMENTS AND THEIR USE.

THE TROCAR AND CANULA.

When using the trocar, special care should be exercised that the canula is not shifted forward beyond the little shoulder of the point of the trocar; otherwise the greatest difficulty will be experienced when endeavouring to insert the trocar into the vein.

It will be noticed that the trocar has three cutting edges at its point; therefore, if it is thrust into the vein without using any screwing motion, it will push with it three little triangular flaps of the wall of the bloodvessel, which press against the outer sides of the canula; consequently, after having obtained the required amount of blood, the canula is withdrawn, and the three little flaps, being of an elastic nature, are immediately brought into their normal position, and act as valves, in consequence of the pressure of blood within the vein, thereby preventing the blood from escaping. In this method there is no tying or stitching of the skin, as is the case when the operation of bleeding is performed by means of the fleam, an instrument which has now become almost obsolete.

To facilitate the introduction of the trocar, the skin of the neck above the vein can be cut nearly through beforehand with a sharp knife.

THE HYPODERMIC SYRINGE.

The reason why a syringe holding 10 c.c. is recommended, when only half the quantity—viz., 5 c.c.—is a standard dose for each animal, is that frequently when filling the syringe a bubble of air gets inside. This does not matter in the least, for by making it a golden rule when inoculating to always hold the syringe in a slanting position, with the nozzle downwards, the exact quantity of blood only is injected, while the remaining blood *plus* the air-bubble are kept back in the syringe.

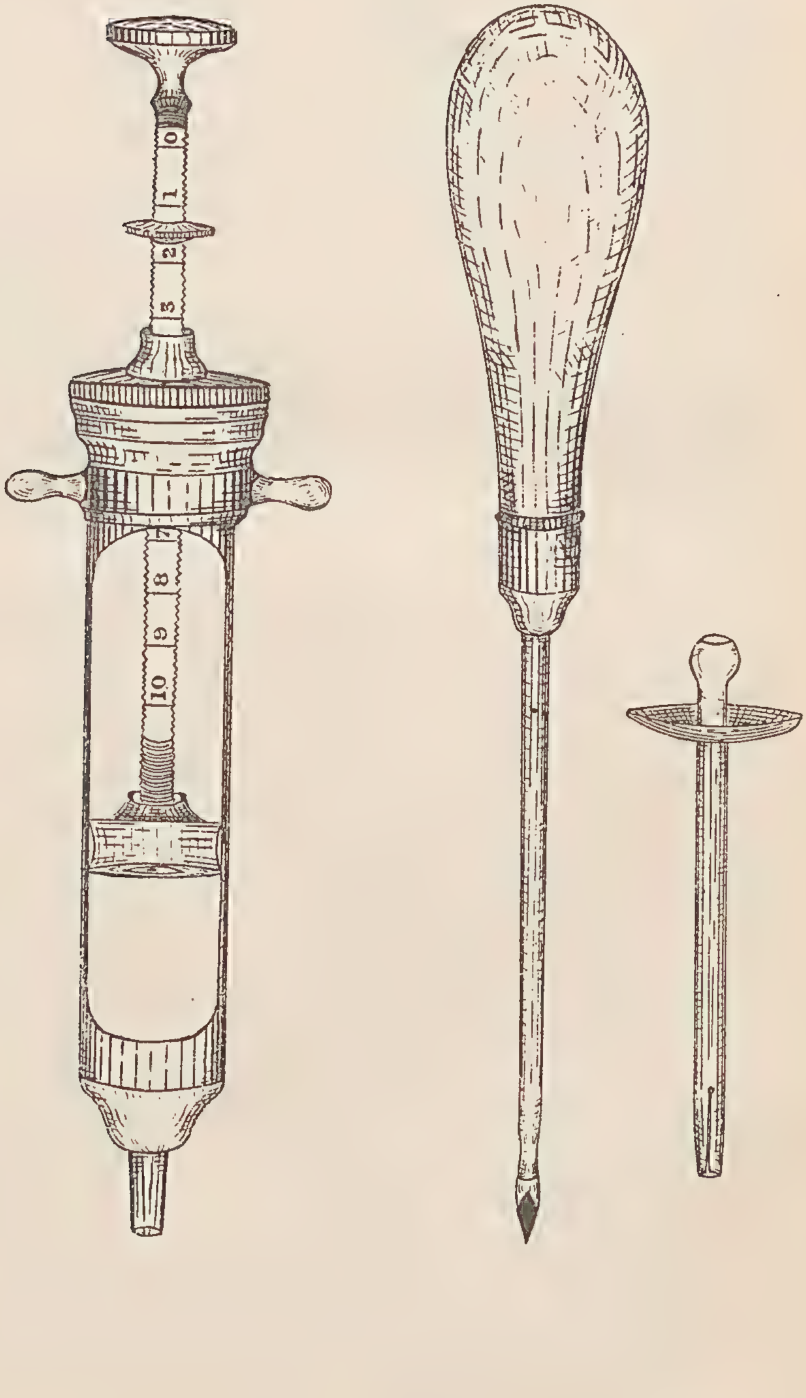
THE IMPROVED DOUBLE-ACTION VALVE APPARATUS.

This accessory is only required when hundreds of cattle are being put through in a day. The improved valves are arranged on exactly the same principle as the valves of a force-pump, so that, at every drawing motion of the plunger, the valve controlling the suction or reservoir tube is opened, and the valve of the delivery or injection tube is closed, the syringe being thus filled, while at any pressure of the plunger the suction-valve is closed, and the delivery-valve opened. The blood, once it has left the supply-bottle, cannot be returned to it through the tube, but can only be ejected through the long tube to the point of the hollow needle, so that, when the needle is placed in position under the skin of an animal, that animal must infallibly receive an injection of blood when the plunger of the piston-rod is pressed home.

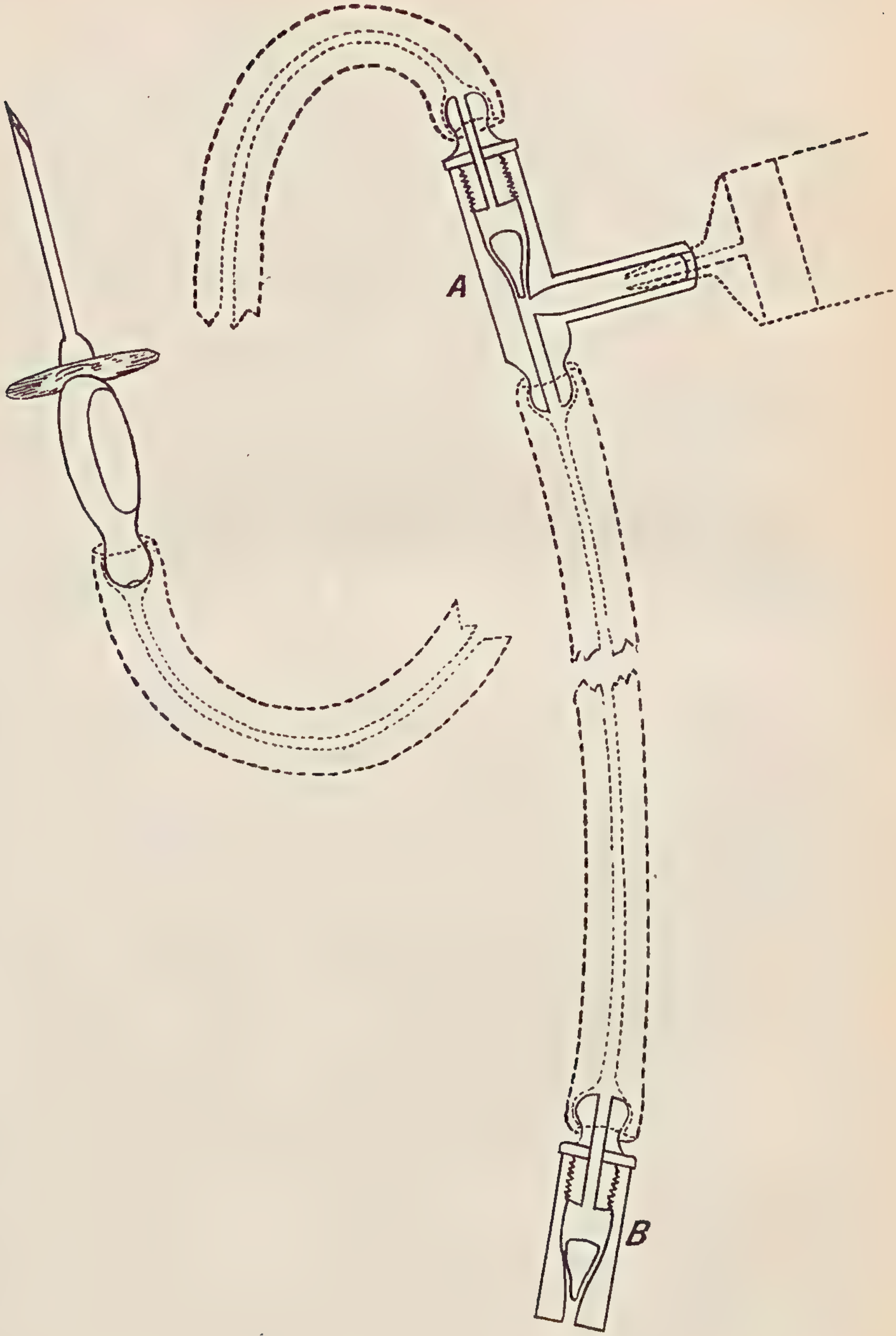
The short piece of rubber tubing connecting the suction-valve is held in proper position by a cork with a V-shaped piece cut out of its side lengthwise, and fitted into the neck of the bottle.

The syringe fitted with the improved valve and long tubing has many advantages:—

1. There is no possible danger to the syringe or the bottle of blood, as the operator in charge of same is enabled by means of the long piece of tubing to stand quite clear of the crush and the cattle to be inoculated.



Inoculating Syringe, Trocar and Canula.



Sketch showing improved Inoculating Needle, and position of valves when in use.

2. The man in charge of the needle has nothing more to do than see that it is properly inserted under the skin of the animal, give the signal, and, after the blood is injected, withdraw the needle, and fix it in another animal.
3. On account of the tubing having a very thick wall and small aperture, it matters not how it is turned and twisted, as the progress of the blood will not be impeded.
4. During the operation the bottle of blood can always be protected from the direct sun's rays and from the dust of the stockyard.
5. The work of inoculating can be carried on more expeditiously, and at the same time much more effectually, than by any other means.

THE CLINICAL (CATTLE) THERMOMETER.

Prior to the first experiments in preventive inoculation for Tick Fever, the clinical thermometer and its use were practically unknown to every stockowner in Queensland. However, it is interesting now to know that this want of knowledge is, in consequence of the information which is freely disseminated by the Bacteriological Institute, fast disappearing.

To the stock-breeder and dairy farmer, the clinical thermometer is most invaluable; for by its use the registration of the body heat affords a ready means of marking the rise and fall of all fevers; likewise the thermometer can be advantageously employed to ascertain whether or not an animal reacts to the injection of blood taken from an animal recovered from natural Tick Fever, as in the case of calves to be rendered immune for the supply of blood for general inoculation purposes.

The clinical thermometer, as approved of and made for the Queensland Bacteriological Institute, consists of a cylindrical tube, hermetically sealed at both ends, about 6 inches long. At one end there is a bulb, the glass of which is very thin and filled with mercury. Running throughout the stem there is a very fine capillary bore, so as to allow the mercury to rise and fall. Immediately above the bulb the fine tube is so constructed that at this particular point the column of mercury from the bulb becomes detached from the column in the stem, causing the latter (a so-to-speak rod of mercury) to act as a register or index. Were is not for this little rod, it would be impossible to gauge accurately the temperature of the animal under observation. Hence the reason why such a thermometer is called "self-registering." Engraved on the glass stem are a number of strokes of three different lengths—viz., long, medium, and short. Opposite the first-named, we have the figures 90, 95, 100, 105, and 110, which indicate the number of degrees upon the scale of Fahrenheit. Between each of these numbers we find four "medium" length strokes, meaning degrees, although not marked in figures. Supposing that the end of the column of mercury stands immediately opposite the medium-length stroke after the figure 100, then it would imply a temperature of 101 degrees Fahr. Lastly, there are the short strokes between those of medium lngth. Each short stroke has the value of one-fifth of a degree, but it has become general to read clinical thermometers to the fraction of tenths of a degree; therefore the space between the short strokes is more properly spoken of as two-tenths of a degree. By way of illustration, let us assume that the index column of mercury rises in the small tube of the stem to the first short stroke after 105. This would imply a temperature of 105.2 degrees Fahr. (*i.e.* $105\frac{2}{10}$); if to the second short stroke, 105.4 degrees Fahr. Again, supposing the mercury rises up to half-way between the second and third short strokes, just above the long stroke 105, then we should say that the temperature was 105 *plus* $\frac{5}{10}$ Fahr.—expressed in figures thus: 105.5 degrees Fahr.

The majority of thermometers are so constructed that the index column, which is exceedingly fine, is magnified when it is observed at a given angle, in order to facilitate the reading.

The way to use the clinical thermometer is by taking it in the right hand, grasping the stem firmly with the fingers, and giving the arm a swinging or centrifugal jerk from the elbow, so as bring the mercury column or index down below 95 or thereabouts. Now raise the tail of the animal with the left hand and quietly insert the bulb, and nearly the whole of the stem also, into the rectum, keeping hold of the extreme end of the stem with the right-hand fingers. Allow it to remain for not less than 4 minutes, and on withdrawing it note where the index stands. This gives the temperature of the body. While taking the temperature the animal should be in a standing position. At the top end of the thermometer the glass is enlarged to form a little knob, below which a piece of string about 12 inches in length is tied, with a loop on the end to be placed over the finger of the operator, in order to prevent the thermometer from falling to the ground when taking an animal's temperature.

When the animal (cow or ox) is in perfect health, its temperature should be 101.4 degrees Fahr. (calves are usually a trifle higher than adults). Anything above 103 degrees Fahr. indicates sickness. As a rule, just before death the temperature of the body falls considerably below the normal.

A temperature	of 103	degrees	implies	slight fever.
,,	,, 104	,,	,,	moderate fever.
,,	,, 105.6	,,	,,	high fever.
,,	,, 106 to 108	,,	,,	very high fever.

The last temperature could not be long endured.

Common abnormal or fever temperatures are 104 degrees, 105 degrees, and 106 degrees, with their intervning fractions of degrees, though less frequently above the last-mentioned number.

It should be specially noted that a temporary high temperature is commonly found after exercise, and is very often caused by excitement.

Rules to be observed in using the thermometer:—

1. Neved place a clinical thermometer in hot water, for, considering that it only registers just about 110 degrees Fahr., it is certain to burst where the glass is thinnest at the bulb.
2. Never allow the animal to drink freely just before taking the temperature, as the body heat is lowered when an animal drinks cold water.
3. Care should be exercised that the thermometer is read in the horizontal position.
4. Always record temperatures in a book kept for the purpose for future reference, and never trust to memory.
5. After each reading, the mercury index should be knocked down to below the normal.
6. Before putting the thermometer away in its case, cleanse it thoroughly with a solution of 1 in 20 carbolic acid.

TREATMENT DURING THE INOCULATION FEVER.

The production of immunity in susceptible cattle by the introduction into their systems of the micro-parasite often results in a more or less serious attack of tick fever. There is also a great diminution in the number of red blood corpuscles.

During the fever the animal should be given a nutritious laxative diet, with plenty of clean and cool drinking water, allowed to rest in a quiet and shady place, and disturbed as little as possible. Experience has shown that the best results are obtained when the following recommendations are carried out:—

If the animal is constipated, an occasional drench containing 3 drachms ammon. carb., 8 oz. Epsom salts, 3 lb. treacle, and 4 pints cold water should be administered. Then, as a tonic, the following should be given every four hours:—3 drachms ammon. carb., 50 grains quinine sulph., 30 drops tincture of aconite, and 1 pint water.

Tincture of digitalis, ½-oz., may be continued with the quinine, according to the nature of certain individual cases.

The following will be found beneficial in the convalescent stage, when the fever has run its course:—2 oz. reduced iron, 4 oz. powdered gentian, 2 oz. powdered nux vomica, 2 oz. powdered rhubarb, and 6 oz. potassium nitrate. This tonic should be given in heaping tablespoonful doses three times a day in the food.

Good nursing is absolutely essential in treating these cases.

By adopting the above method of treatment very excellent results have been obtained during the past year in the inoculation of large numbers of valuable stud cattle. In several lots of from 10 to 40 head, although each animal had a most pronounced fever reaction, not one died.

GENERAL ADVICE.

The success of inoculation entirely depends upon several important factors, which, as a rule, are not readily adopted by a large number of stock-owners. However, the minimum of losses has occurred among cattle inoculated where the following rules have been strictly adhered to:—

1. Absolute cleanliness during the process of drawing the blood.
2. Using only perfectly disinfected instruments.
3. An egg-whisk should not be used for defibrinating the blood, as it is liable to break up the fibrin into small fragments.
4. Exposure for even a short period to the direct sun's rays is extremely detrimental to blood, and impairs its qualities for inoculation purposes.
5. It is advisable that, as dust is certain to arise in the stockyard during the operation of inoculating, the mouths of the bottles containing defibrinated blood should be kept well covered with several pieces of clean linen or calico, and kept in a cool, shady place.
6. (*a*) No more blood should be taken from an animal and defibrinated than can be used within six hours, for if kept longer the blood is apt to become contaminated with various kinds of bacteria, which are floating about in the atmosphere of the stockyard or shed, or other foreign matter, which, injected into an animal, might either produce blood-poisoning or an abscess.
   (*b*) For general inoculation purposes, only use the blood from an animal that has given a decided reaction after an injection of either recovered or virulent blood.
7. Five c.c. of blood has been found to be a standard dose for animals of any age and either sex.
8. Inoculation should proceed steadily, care being taken to avoid all attempts at breaking records.
9. During hot summer weather inoculate only early in the morning and late in the afternoon.
10. (*a*) Never inoculate cows heavy in calf.
    (*b*) It should be remembered that old bulls are the most susceptible of all animals; therefore, if there is no immediate danger from natural tick infection, it is inadvisable to inoculate them.
11. It is advisable, when inoculating on an extensive scale, to occasionally examine and test the needle and syringe, in order to see that they work freely, as a little piece of dirt or a hair will throw the valves out of order.
12. Cattle should be inoculated as near to their own pastures as possible, and in any case should, if inoculated some distance away, be allowed to travel back slowly without the aid of whips and dogs.
13. After inoculation, cattle should not be disturbed or interfered with in any way for at least three weeks.

14. During the cold weather in winter months it has been proved that blood can be carried with safety in well-corked clean bottles for from twenty-four to thirty-six hours either by rail, coach, or on horseback.
15. All the inoculating instruments, before and after use, should be thoroughly disinfected with 1 in 20 carbolic acid solution.
16. The rubber washers and plunger of the piston-rods should be thoroughly cleaned and washed in carbolic solution, and a little glycerine applied, which will prevent the rubber from becoming hard and deteriorating.
17. It is advisable in the latest form of syringe to soak the red rubber washers in warm water before use.
18. Never use vaseline or oil of any description on the rubber parts of the syringe. Glycerine is the best lubricant.
19. The needles and trocar after use should be well washed in boiled water, then rinsed in cyllin solution 1 in 400, carefully dried, and rubbed all over with a little vaseline.
20. Never disinfect any of the inoculating instruments with corrosive sublimate (bichloride of mercury) solution, as it readily corrodes the nickel plating.
21. The long pieces of rubber tubing when not in use should be kept under water, to which a few crystals of thymol have been added, in a large, well-stoppered, wide-mouthed jar.

Important Note.—It should be specially pointed out that repeated experiments have shown that some animals do not react to the first inoculation; therefore it is recommended that, wherever practicable, cattle should be inoculated a second time after an interval of not less than six weeks, for experience tends to prove that a second inoculation rarely ever fails. Moreover, by following this mode of procedure, stock-owners have the satisfaction of knowing that the possibility of their cattle not being immune to a subsequent attack of natural Tick Fever is reduced to a minimum.

PROFESSOR KOCH'S METHOD OF IMMUNISING CATTLE AGAINST RHODESIAN REDWATER.

(Abstract from Report dated 25th September, 1903.)

The process recommended is devoid of risk, and is inexpensive. For the present, I advise that it be only applied to animals exposed to imminent risk of infection, to infected herds, and to animals running on infected pastures, particularly to herds in which isolated cases of the disease have only recently occurred. The work of carrying out such inoculations should, when possible, be left to veterinary surgeons or to those who have been instructed in the method. The animals used for taking the blood intended for inoculation purposes should be in apparent good health and condition, and should be either animals which have recovered from an unmistakable attack of the disease, or animals which have survived an outbreak which has carried off the majority of their neighbours, and which have subsequently grazed for a long time upon veldt known to be highly infected, and, when, possible, the blood should be first microscopically examined before use, in order to determine whether the organisms usually found in the blood of recovered animals are present.

For the convenience of farmers and stockowners who are so situated that they cannot obtain the assistance of a veterinary surgeon, and who are unable to get an object lesson in the process of inoculating, the following directions are appended:—

To inoculate, the operator should provide himself with the following appliances:—

A lancet or sharp-pointed knife.

A trocar with canula about one-eighth of an inch in diameter, or a canula of this size pointed in the same manner as a hypodermic needle, to draw off the blood which is to be used for inoculating.

A wire egg-whisk, which has previously been cleaned by boiling or heating to redness in a fire.

A hypodermic syringe to contain 10 c.c., which should have previously been boiled along with the needles to be used for inoculating.

Two enamel pitchers to hold about half a gallon each, which have been rinsed first with a 5 per cent. solution of carbolic acid in water, and then washed out with boiled water.

A few pieces of freshly boiled clean muslin to strain the blood.

To prepare it for the operation of bleeding, it should be cast, its legs secured, and the head held down. The jugular vein is then raised by passing a strong cord round the base of the neck. The hair should then be clipped off over the vein and the skin washed with soap, using a 5 per cent. solution of Jeyes's fluid or carbolic acid in water; then make a small incision over the veing along its length, with the knife cutting through the skin, insert the trocar and canula into the vein, passing the trocar upwards in the direction of the head; withdraw the trocar, leaving the canula in the vein, and draw off the blood required into one of the enamel pitchers, stirring it all the time with the wire-whisk to prevent it from coagulating.

When a sufficient quantity of blood has been taken, the cord should be loosened from the neck and the canula withdrawn. The wound may then be closed by placing a piece of adhesive plaster over it, by putting a stitch through the skin on either side with a suture needle and suture silk, or by pinning the lips of the wound together with a pin, which should only pass through the skin, and then twisting a piece of silk around the pin figure-of-eight fashion.

After stirring the blood for ten or twelve minutes it should be strained through a piece of clean muslin into the other enamel pitcher, and carefully covered to keep out dust and flies; it will then be fit for use.

As a pint and three-quarters of strained blood is sufficient to inoculate 100 head of cattle, it will seldom be necessary to draw more blood from an animal at one time than three pints, which, when whisked up and strained, will give at least 1,000 c.c. suitable for inoculating with, although, if necessary, three or four quarts can be taken from an animal without injury. Every care should be taken to cleanse the site of the operation before bleeding, and the vein should be injured as little as possible when the trocar is inserted.

In cases of urgency, where a trocar and canula cannot be procured, the jugular vein may be raised in the ordinary way and the animal bled with a fleam, but by so doing there is more risk of damaging the vein than if a canula is used, and the blood is more likely to be contaminated.

To inoculate animals which it is desired to protect, the animal is secured, the syringe is filled with strained blood, the loose skin of the neck is gathered up between the thumb and forefinger; the needle of the hypodermic syringe is inserted under the skin, 10 c.c. are injected, the needle is withdrawn, the swelling caused by the injected blood is rubbed away gently with the hand, and the animal is released. The dose for all animals is 10 c.c., irrespective of age.

In the last report of Professor Koch on African Coast Fever, dated February, 1904, he "strongly recommends using 5 c.c. of recovered blood instead of 10 c.c.," thus agreeing exactly, so far as the quantity of recovered blood to be used is concerned, with what was recommended in Queensland in 1897.

The most salient points in Professor Koch's report are summed up in brief in the last but one paragraph:—

"Such expedients as fencing, dipping, spraying, and moving animals have only a temporary value, as sooner or later the disease will extend to and involve all the herds in the vicinity of an infected area. Therefore, such precautions should be supplemented by inoculation with recovered blood whenever disease appears in the vicinity."

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.		1907.										
	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
North.													
Bowen	0·99	11·01	2·53	3·74	1·97	0·39	3·46	2·87	Nil	1·28	0·51	0·06	3·71
Cairns	13·26	11·31	18·36	11·49	3·26	3·35	8·65	4·45	0·12	0·39	1·35	0·68	5·35
Geraldton	21·08	21·20	29·58	25·26	4·58	6·08	21·91	8·54	2·39	4·66	1·36	1·42	6·45
Herberton	5·16	10·82	10·56	11·77	2·05	0·90	1·57	2·71	Nil	0·11	0·12	0·17	3·41
Hughenden	0·51	4·76	1·98	3·83	1·17	0·16	1·34	0·95	1·16	Nil	Nil	1·66	0·66
Kamerunga State Nurs.	10·00	8·17	15·78	14·82	4·87	2·80	9·33	5·29	0·13	1·15	1·19	0·53	2·76
Longreach	0·66	0·51	1·22	0·49	1·88	0·85	0·93	0·49	0·49	0·04	Nil	1·08	2·83
Lucinda	6·60	*22·36	12·38	23·82	4·53	3·92	19·29	6·34	0·29	1·05	1·19	0·25	0·43
Mackay	1·80	12·93	2·72	6·42	8·01	1·58	*6·09	5·04	0·27	0·25	0·12	0·12	5·76
Rockhampton	0·46	5·19	4·15	4·42	3·05	0·44	0·94	4·16	0·84	0·47	Nil	0·47	3·72
Townsville	7·74	14·03	12·49	7·75	7·37	1·03	3·11	2·38	Nil	0·07	0·14	0·03	2·82
South.													
Barcaldine	1·33	1·04	3·44	0·43	1·51	0·82	0·34	2·03	0·87	0·06	Nil	1·21	1·54
Beenleigh	1·75	3·98	4·75	3·88	4·17	0·58	4·70	4·92	0·71	0·58	Nil	1·73	2·81
Biggenden State Farm	3·09	4·55	5·77	3·55	10 91	0·34	4·02	5·24	1·51	0·96	0·24	1·99	2·50
Blackall	1·37	1·96	2·30	Nil	2·78	1·69	0·20	0·36	1·36	0·06	Nil	0·88	0·80
Brisbane	1·07	3·28	2·69	5·23	5·32	0·45	4·75	2·91	0·39	0·79	0·10	1·37	4·25
Bundaberg	0·97	3·85	3·29	3·90	12·81	0·38	3·08	4·49	0·87	0·43	Nil	1·70	2·90
Caboolture	4·26	3·15	2·53	8·03	9·04	0·78	3·10	4·98	0·73	0·32	0·13	2·09	3·75
Charleville	1·30	3·71	0·85	Nil	2·75	2·29	0·26	0·90	1·04	0·76	0·02	1·69	3·88
Dalby	2·12	5·67	5·60	1·34	3·72	0·20	2·26	2·35	0·87	0·71	0·15	0·69	5·18
Emerald	2·32	1·79	7·36	3·67	7·66	Nil	Nil	2·53	1·75	0·10	Nil	0·98	1·84
Esk	2·45	5·26	2·87	6·79	3·60	0·22	5·42	2·66	0·54	0·81	0·57	0·50	3·76
Gatton Agric. College	2·01	3·45	2·62	6·44	2·71	Nil	2·80	1·85	0·54	0·56	0·15	0·71	3·01
Gayndah	4·25	2·82	3·00	1·91	6·89	Nil	2·65	3·00	1·21	0·53	0·40	0·34	4·65
Gindie State Farm ...	2·95	1·45	6·13	0·71	10·10	Nil	Nil	2·29	1·58	0·10	0·16	0·61	1·57
Goondiwindi	2·32	4·04	5·37	1·77	6·51	0·33	1·30	1·09	1·62	0·95	0·12	1·13	2·91
Gympie	4·12	5·32	3·99	6·96	8·93	1·12	3·84	3·77	0·80	0·17	0·47	1·20	3·05
Ipswich	0·71	4·22	2·17	5·38	1·95	0·12	3·43	2·22	0·30	0·43	0·05	0·78	4·45
Laidley	1·78	4·12	2·84	4·50	3·47	Nil	2·99	1·56	0·45	0·58	0·15	0·87	1·97
Maryborough	2·49	4·39	5·52	7·84	10·28	1·25	3·21	6·05	0·64	0·93	0·25	2·74	3·49
Nambour	3·40	6·74	5·74	12·05	13·30	1·36	4·54	6·96	1·08	1·13	0·60	1·38	2·98
Nerang	2·75	6·33	9·86	6·04	7·83	1·48	7·54	5·08	1·26	1·35	0·05	0·86	3·88
Roma	1·32	4·31	6·32	2·92	1·87	0·42	0·27	2·47	1·03	0·42	0·04	1·04	3·70
Stanthorpe	2·49	4·89	4·33	3·30	5·98	1·68	1·79	2·44	1·06	1·65	0·13	1·30	5·03
Tambo	1·23	1·16	4·74	1·41	3·58	3·69	0·11	0·89	1·42	0·09	Nil	0·68	2·03
Taroom	1·35	5·49	5·16	1·10	1·86	Nil	1·01	3·76	0·70	0·04	0·10	0·67	6·82
Tewantin	2·73	9·53	6·38	15·83	11·45	1·87	7·16	7·61	1·48	0·95	0·55	1·05	3·12
Texas	2·23	1·83	4·69	4·55	6·16	0·65	0·93	1·62	1·31	0·87	0·07	1·83	2·78
Toowoomba	2·65	4·11	3·94	4·00	4·81	0·01	4·61	3·34	0·91	0·65	0·17	1·58	5·12
Warwick	2·99	5·50	3·95	2·52	5·71	0·51	1·58	1·27	1·16	1·37	0·01	1·37	3·25
Westbrook	1·79	1·48	1·79	2·91	5·13	0·02	2·53	2·53	1·04	1·78	Nil	1·08	4·76

* Compiled from telegraphic reports.

GEORGE G. BOND,
For the Hydraulic Engineer.

General Notes.

THE BANDICOOT.

Mr. H. L. Poulsen gives us the following very interesting account of the omnivorous habits of the bandicoot. Most farmers who are troubled by the persistent attacks of this animal on seed corn, sweet potatoes, &c., have the idea that the bandicoot is a vegetarian. This is quite a mistaken impression. Mr. Hy. Tryon, Entomologist and Vegetable Pathologist to the Agricultural Department, says that the bandicoot is as much a flesh-eater as any other semi-vegetarian. Mr. Wild, Director of the Queensland Museum, says the same thing, and considers that Mr. Poulsen is quite right in stating that the animal is omnivorous, and he has no reason to doubt the latter's assertion that the animal he caught killing the chicken was a bandicoot. Mr. Poulsen's communication, which will come as a surprise to many farmers and poultry-breeders, is as follows:—

Several months ago there appeared in the Journal directions for making a bandicoot trap, and the writer volunteered the information that the bandicoot is a vegetarian. I have been waiting for a contradiction of that statement, as I consider that it must be classed as omnivorous. In this district it is credited with being the cane-growers' best friend, in that it largely subsists on the grub of the cane beetle, and the many small excavations about the stools of grub-infested cane bear evidence to its utility. This may be considered as merely circumstantial evidence, but I have better proof that it does not confine itself to a vegetable diet. Being without a dog on the farm, I found a sitting hen was disturbed of a night and the eggs disappearing by degrees. To stop this I chipped a small hole in an egg, inserted a little strychnine, and pasted a bit of paper over the opening. The following morning I found a dead bandicoot close to the nest, and the poisoned egg had disappeared. One night lately I had occasion to go out with a storm lamp, and actually surprised a bandicoot in the act of killing a chicken. If any of your readers is still in doubt about the diet of this animal, then he will find on examination that it is provided with large canine teeth. As a friend of the cane-grower it ought to be protected in the sugar districts.

[As regards the canine teeth, Mr. Tryon describes them rather as the two great gnawing teeth of the wallaby, not the true canine teeth of a carnivore.—Ed. "Q.A.J."]

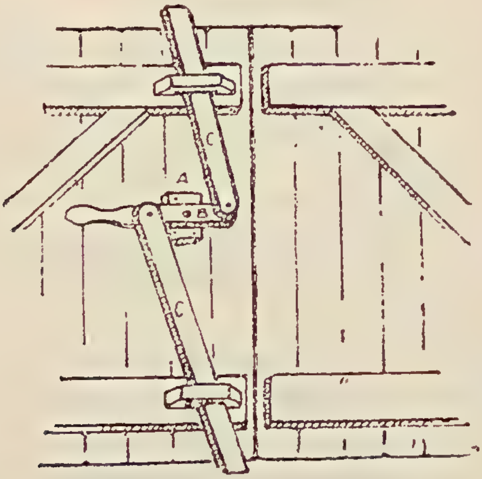
COCOANUT BEETLE.

From the thirty-fourth report of the Ceylon Agricultural Society, published in the "Tropical Agriculturist," we take the following suggestion for the trapping of cocoanut beetles, which will doubtless interest many of our readers in Papua and the Solomon Islands who are engaged in cocoanut-growing:—

Cocoanut Beetle.—The Ratemahatmaya of Demala hatpattu, in a letter to the Government Agent, North-western Province, suggests an easy and effectual way of destroying cocoanut beetles. He says: "Take a quantity of castor seed, say, about four measures, pound and extract the oil by boiling with water as is done with the cocoanut, remove the oil for use, put the water and the sediments into an earthen vessel with a large mouth, and leave it under a tree on the estate, taking care to close it up during rainy weather. The beetles in the neighbourhood will be attracted to the vessel, fall into it, and die."

DOUBLE DOOR-FASTENER.

For well securing a double barn door (says the "Farmer and Stock-breeder") or any other double door, an effective and economical device is depicted in the accompanying illustration. B is a lever 16 inches long. A hole is bored at B for attachment by bolt to the block A. The latches CC are



attached to the lever at either side of B, so that an upward movement of the lever removes the bolts CC, while a downward movement forces them into the mortises in the sills provided for them. The latches should be made and attached to the door before the mortises are made, a plan which will shorten and simplify the arrangement of fitting.

ENSILAGE MAKING.

Dr. Cherry, Director of Agriculture in Victoria, says in regard to the above:—"The best ensilage is made from plants with a solid stem, such as maize, sorghum, or amber cane, while with these crops there is the further great advantage that the whole of the stem, if the material is chaffed, becomes so soft and succulent that none is wasted by the animals. Considering also the total yield per acre, there is no question that where a crop is specially grown for silo one of these should be chosen.

"The hollow stem of cereals contains air, and this increases the loss by fermentation, even when chaffed; but, in spite of this defect, there is no better way of utilising a crop of rye or barley grown for fodder which has become over-ripe to be relished by the cows. If other methods of securing green fodder are available, oats, wheat, and the mixed grasses and clovers are better made into hay. A mixture of peas, beans, tares, or clover, with maize or cereals, greatly increases the food value of the silage, and, according to Canadian experiments, 1 acre of sunflowers with 2 acres of tick beans and 4 acres of maize makes a very satisfactory balanced ration for the dairy cow.

"Ensilage should contain 75 to 80 per cent. of water—that is, most crops should be siloed when the flowers are all out and the grain well formed. An exception occurs in clover, trefoil, and lucerne, which should be cut when in full bloom and allowed to wilt one day before filling into the silo. Generally speaking, a crop is ready for the silo a little earlier than it is for hay. Maturity is very important in the case of maize and similar crops which mature rapidly after the cobs are formed. Immature maize contains little nutriment."

THE BOY ON THE FARM.

An English writer says:—There is no better way to make a boy stick to the farm than to give him a few sheep and teach him how to care for them, and allow him the proceeds from his little flock. You will be out very little, and you will be surprised how much he will make on the small investment compared with some of his father's larger investments.

VALUE OF SHEEP MANURE.

It has been found that 36 lb. of sheep manure is equal as a fertiliser to 100 lb. of ordinary farmyard manure, being richer in nitrogenous substances than that of the cow or horse, ranking next in ammonia, and richer in the phosphates than guano or the droppings of fowls. In the face of such conclusive and indisputable evidence, why will farmers neglect to keep a few sheep?

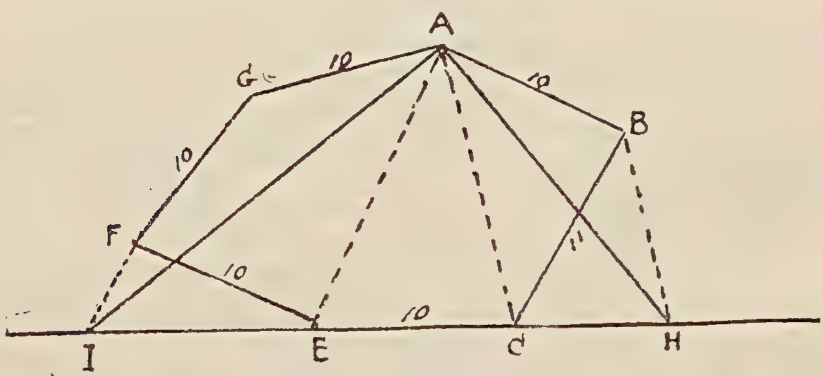
TO MEASURE AN IRREGULAR PIECE OF LAND.

The area of any piece of land containing more than five sides may be obtained by turning the shape into a single triangle, and more accurately than by cutting a plan into numerous triangles.

EXAMPLE 1.

A piece of land, A B C E F G, is to be measured. Take A as the apex of the triangle. Draw a dotted line from A to C, C being the innermost point on the right side. Then draw B H parallel to A C, cutting the extended base at H. Draw the line A H, which is one side of the triangle to be constructed, and which exactly halves the parallelogram A C H B. Now draw A E, E being the innermost point, and draw F I parallel to A E, F being the outer-

Fig. 1.



most point cutting the extended base at I. Then draw A I, which is the other side of the triangle, and complete the whole triangle A I H, which contains the exact area of the irregular piece of land.

Scale, 10 chains to 1 inch.

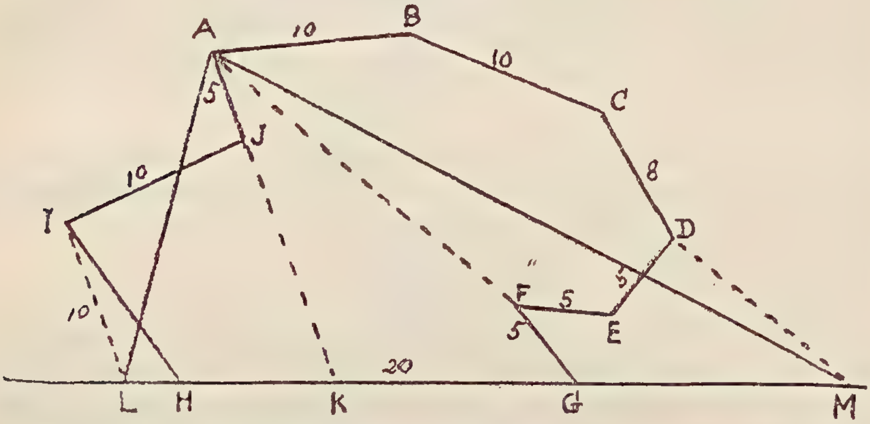
EXAMPLE 2.

Take a still more irregular plan, with more than five sides, such as A B C D E F G H I. Take the longest side for a base, and extend its length indefinitely. Then take parallel rulers and lay them from the highest or the next point, as shown by the dotted line A to F, and run the dotted line D M,

cutting the extended base at M. Then draw the line A to M, which is one side of the triangle. For the other side draw the dotted line J K, J being the innermost point on that side, and draw the dotted line from I, which is the outermost point on that side parallel to A J, cutting the extended base at L. Then draw the line A L, which makes the second side of the triangle. You have then the triangle A L M, which contains the exact area of the land in question.

Scale, 10 chains to 1 inch.

Fig. 2



The area of the resulting triangle may be found as follows:—

From half the sum of the three sides subtract each side separately; multiply the half sum and the three remainders together; the square root of the product will be the area.

FLIES FOR EXPORT.

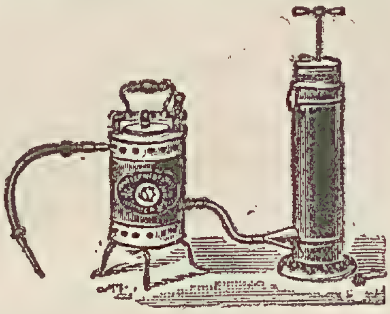
In 1898 the "Mark Lane Express" stated that a company, called the "Insectivora Food Company," was advertising, in London, a new food for poultry under the name of "Preserved Tropical Flies." This was looked upon by some as a Yankee yarn, but it is far from being so. To-day we find that the demand in London for dried flies far exceeds the supply. Considering the quintillions of flies which make life in the Western Central districts so enjoyable to man and beast, we wonder that the fly-catching industry has not caught on there. Here is the latest on the subject:—

In the little villages dotted among the swamps and forests that border on the Upper Amazon there are many who gain a living by catching, drying, and exporting flies to the London market. Flies are the curse of the land round the great South American river, but a few years ago it was discovered that flies have a commercial value. The natives put out in their boats, furnished with close-meshed nets, and catch the flies in millions as they swarm above the surface of the water. The insects are killed, dried in the sun, and exported in bags of 70 lb. to England, and used as chicken food. A well-known London manufacturer discovered some years ago that chickens were very fond of flies, and decided to bring out a chicken food containing them, with the result that he uses great quantities of flies in a year. The flies are brown in colour, and about the size of a bluebottle, and mingled with them can be seen tiny fish swept up in the nets. Sufficient flies cannot be obtained in this country to meet the demand; and, besides, there is not so much nutriment in an English as a South American fly.

A WHITE ANT EXTERMINATOR.

In the "Natal Agricultural Journal" for July, 1906, Mr. Claude Fuller, Government Entomologist, illustrates and describes a machine for the destruction of white ants, placed on the market in South Africa by Messrs. P. Henwood, Soutter, and Co., agents for the sale thereof.

This contrivance consists of an air-pump, connected by a short length of rubber hose to a furnace. By working the pump a continuous blast of air is driven into the furnace, entering beneath and escaping through a pipe near the top—shown to the left of the illustration—to which is attached a flexible iron hose. A charcoal or cow-dung fire is first started in the furnace, and, by pumping, got thoroughly alight. A powder is then sprinkled over the fire and the lid closed. By continuing the pumping a very hot cloud of poisonous smoke is driven out through the flexible hose. In use, the nose is inserted into a gallery of an ant's nest and the smoke pumped in.



Having had one of these machines in use for the past three or four months, I have no hesitation in saying that in the "Universal Ant Exterminator" we have the most efficient and effective apparatus for destroying white ants in their nests which has yet come under notice. Upon many occasions I have succeeded in killing out huge colonies—nests 15 and 20 feet across—where I have previously failed to destroy the lot. Treated nests which have been dug out reveal the death of every inhabitant, and show deposited upon the walls of every chamber and gallery a poisonous coating.

Two rather unique cases in the use of the pump are worth recording. In the first case a white-ants' nest was discovered beneath the flooring of a farmhouse and dugout. Later, I loaned the machine to the owner in order that he might test its efficiency. White ants were noticed working at the mouth of a gallery 80 feet away from the house. Here the fumes were pumped in, and a few minutes later a cloud of smoke issued through the flooring of the room from beneath which the nest had previously been dug out. The gentleman to whom the machine was loaned has since purchased two, and is now working over the whole of an estate of 5,000 or 6,000 acres.

In the second instance honey bees had become a decided nuisance, making their nests between the lining and the roofing of a large veranda. Auger holes were bored through the ceiling boards, and the smoke pumped in through a length of iron piping. The immediate result was to drive out the bees through every exit hole they knew of. Many dropped dead, but the great majority escaped alive. Afterwards, of course, the bees returned, and, naturally enough, started to work cleaning away the deposit; this poisoned them off.

Wherever a gallery, sufficiently large to admit the nose of the hose, can be obtained (about half an inch in diameter), the machine can be used with the most satisfactory results; not only are the insects killed, but the gallery is thoroughly poisoned for an indefinite period.

The powder spoken of is sold with the pumps. A cheaper and equally effective powder can be obtained by farmers at the Department of Agriculture, Maritzburg, at 8d. per lb.

Answers to Correspondents.

GANGRENOUS MASTITIS.

JAS. ARMSTRONG, Junr., Archer Siding.—

Your cows are suffering from *gangrenous mastitis*, due to organisms that gain entrance through the teat or through small wounds of the udder. Any cause that will induce ordinary inflammation of the udder, such as bad milking, &c., will, if the necrosis and putrefactive organisms are present, induce gangrene.

Treatment.—Isolate all cows whose udders are affected, and the man who milks these cows should not be allowed to touch the healthy ones. The milker's hands, the udders of the affected cows, the ground of the bail where the sick cows are milked, and the vessels in which the milk is collected should be thoroughly disinfected with one of the following disinfectants:—

Corrosive sublimate solution, in water, in the proportion of 1 to 1,000; lysol, 2 per cent. solution, in water; carbolic acid, 5 per cent.; creolin or cyllin, 2½ per cent.; Little or Quibell's fluid sheep dips, 2½ per cent.

The milk of the affected cows should be mixed with some of the disinfectant and thrown away.

The ground of the milking-shed might be sprinkled with lime with advantage. The affected cows should be thoroughly stripped out, and the udder injected by means of a teat syphon and a syringe with a solution of chinosol in the proportion of 15 grains of chinosol to a pint of warm water. About half a pint should be injected into each quarter, and the fluid thoroughly distributed by manipulating the udder for 10 or 15 minutes. The udder should then be stripped out, and the operation repeated about three times daily.

After being removed from an affected quarter the teat syphon should be placed for a minute or two in one of the solutions of disinfectant recommended above.

When there are signs of mortification of some part of the udder, denoted by coldness, greenish colour, and foul odour of the part, the dead part should be cut away with a knife, the knife passing through the healthy tissue around the dead part. The bleeding may be stopped by the application of a hot iron and the wound dressed with Stockholm tar.

If any of the larger milk veins have to be cut, it is first necessary to ligature them by passing a piece of silk under the vein by means of a needle, and then tying the silk around the vessel.

Internally.—The cow may be given 6 oz. of Epsom salts daily in a quart of gruel and beer.

COTTON-PICKERS.

COTTON, South Coast Line.—

A reasonable quantity for a young cotton-picker is 80 lb. a day. Experienced pickers will regularly bring in 100 lb., and exceptionally quick, experienced hands frequently average 200 lb. a day. In the West Indies, in Egypt, and in the United States, during the early ripening season, only very few are required, but later, when the crop is maturing rapidly and large quantities are ready for gathering at the same time, the number of pickers is considerably increased for a short time; later still, the number may be again decreased. In the height of the season one picker per acre is quite sufficient. On some estates, no more than one picker to 3 acres is ever employed. The greater number of pickers is required where Sea Island or Egyptian cotton, and probably Caravonica, are planted. As far as Queensland experience goes, one picker can easily manage 5 acres of Upland cotton, and one grower in the Central district says he can pick a 10-acre crop without employing extra hands.

THE CAMPBELL DRY-SOIL SYSTEM.

CEREAL, Kingaroy.—

The storage and conservation of rain waters by adopting a system of cultivation at the right time to allow for and induce percolation of moisture, and its subsequent retention in the soil by checking evaporation by means of a blanket mulch.

Pulverising and packing of the sub-surface to form a seed and root bed; to increase its water-holding capacity, and to assist the capillary movement of moisture. Constant stirring of the surface to ensure reception and retention of moisture.

Briefly, for new land, the methods to be as follows:—

Breaking-up: Plough shallow, say 2 inches, preferably in spring. Land must be moist. Turn sod completely over. Then roll. Follow with Acme or common harrow, to thoroughly pulverise land free soil from sod, so as to fill in all interstices and second a good blanket mulch. Harrow after each rain.

When soil beneath blanket is rotted and moist, say January or February, thoroughly pulverise by double discing—*i.e.*, lapping one-half each round. Plough with stirring or stubble plough, cutting about 2½ inches to 3 inches deeper than the first ploughing; follow with sub-surface packer, and harrow down fine either with Acme or ordinary tine harrow. It is absolutely essential to pack and harrow the morning's ploughing before going to dinner, and treat the afternoon's work similarly.

Land should not be allowed to crust or become weedy, and must be periodically stirred after each rain; failing rain, observe whether the soil below mulch is becoming dry; if so, cultivate again. In fact, the surface must be kept stirred to ensure proper protection of moisture. For hot weather, the mulch should be made deeper as an additional protection—say, fully 3 inches. Under favourable circumstances, land broken up, say in August, may, after above described treatment, be sown with wheat in May, but it is preferable to ensure that at least twelve months' rain is stored in the cultivated land before cropping.

From available information it is gathered that a year's preparation at least should be made for conserving moisture, although exceptions have been given when by ploughing, with subsequent operations, in the early spring of one year, the land has been cropped by seeding down with wheat or spring crops.

PLOUGHING IN COWPEAS.

F. E. EGGAR, Yandaran.—

Opinions differ as to the proper time to plough in cowpeas, some affirming that it should be done when the plants are in flower, others maintaining that the seed pod should first have formed. The whole business of green manuring is based on a philosophical knowledge of the nature of plants, and will repay careful examination.

In the first place, the seeds of plants are sown which, like cowpeas, clover, lupines, &c., have a peculiar faculty for profiting by the food which they find in air and deep in the subsoil; or plants are chosen which, like the above, or like buckwheat or rye, have the power of extracting nourishment from the earth, even under very unfavourable conditions. These plants are allowed to grow until they have gathered from the soil all the matters they are capable of gathering—that is to say, the plants are left *until they are in flower*—and then they are ploughed under. By operating in this way the land is manured with everything that the plants have accumulated, either from the air or from the soil, or from the waters in the soil, and there is placed within the land a mass of organic matter which, by its decay, will give off enormous quantities of carbonic acid to disintegrate and dissolve the components of the crude soil.

There is one danger which must be kept in view and guarded against when possible. On light land serious trouble might ensue if a drought should set in immediately after a green crop has been ploughed under. For, unless there be moisture enough in the soil to rot the buried plants, the field would be left in a bad condition. In case of need, the land should be rolled after the ploughing, and even cultivated a little on the surface, to prevent the moisture from drying out from the rolled earth. An acre of well-grown cowpea will amount in weight to from 1½ to 2½ tons, and when this mass is turned under it gives up 64 to 70 lb. of nitrogen, 21 to 25 lb. of phosphoric acid, and from 100 to 130 lb. of potash. The most barren soils may eventually be rendered fertile by green manuring with velvet bean or cowpeas. It is merely a question of time. It is a question of the highest importance how to retain this nitrogen, which is the most fugacious element in the whole list of fertilisers. Ploughing under, even is not a positive guarantee of the retention of the nitrogen, since all varieties of soil seem to have slight affinity for nitrogen, and it is left to evaporate or wash away in the waters of drainage.

The only sure expedient, therefore, is to plant another crop to hold the fleeting element until spring, by absorbing it into its own tissues. This retaining or cover crop may be rye, oats, or winter vetch, and the latter is, in some respects, the best of the three, because it is a legume itself.

The lasting effect of a crop of cowpeas ploughed under will depend on the amount of nitrogen contained in the green manure and the amount abstracted from the soil by the crop grown. If maize be sown after cowpeas, two crops might be taken off before refertilising. With sugar-cane, as in your case, the matter is different, as the cane would not be ploughed out until probably the third or fourth ratooning; therefore, other means would have to be adopted after the green manure is exhausted. Cowpea can be ploughed under in from four to four and a-half months after sowing; 9 lb. of seed are required per acre, and sowing may be done from the beginning of spring to New Year.

Read the article on cowpeas by H. A. Tardent in the issue of this Journal for March, 1907.

PEACH-LEAF POISON BUSH.

INQUIRER, N.C. Line.—

The specimen you sent for identification is the *Trema aspera*, or Peach-leaf Poison Bush, so called, although Mr. F. M. Bailey, Colonial Botanist, does not consider it contains any poison. If stock eat it combined with other fodder it will do little harm, but if fed on nothing else it will probably kill them, owing to its containing a tough, fibrous substance, which causes indigestion, with often fatal results.

AQUATIC GROWTH IN WELL WATER.

POULSEN, Childers.—

If the tank is an open iron tank, it is generally sufficient to cover it up to prevent the growth of vegetable matter. Algæ may be easily destroyed by adding to the water a minute quantity of copper sulphate—about 1 oz. of copper sulphate (blue vitriol) per 3,000 gallons of water.

EXTERMINATING RATS.—COVERING AN ENSILAGE STACK.

I. P. FALLON, Greenmount.—

1. The lye is made of caustic soda. Mix it with molasses to the consistency of a paste. Smear on a board, and place the board near the rat hole. All that is needed is for the rats to run over the smeared surface of the board. The lye sticks to their feet and burns them. Then they lick their feet, after which they will cease from troubling you.

2. It is always advisable to cover an unfinished ensilage stack in the event of heavy rain occurring. There is quite sufficient moisture in the green crop without adding more to it.

Publication Received.

DE-NATURING ALCOHOL.

What does de-naturing alcohol mean? To the majority of persons alcohol means liquor—something to drink—but few know that, beyond its use as a stimulant, and to some extent in the arts and as a fuel, it is also a source of power as a substitute for gasolene, petroleum, and kindred hydrocarbons. When the De-naturing Act was passed by the last American Congress, alcohol leaped into fame, not as an intoxicant, or as the humble servant of a lamp, but as a new farm product.

On this subject we have received from Messrs. Spon and Chamberlain, publishers, New York and London, the second edition of "A Practical Handbook on the Distillation of Alcohol from Farm Products, including the De-naturing of Alcohol for use in Farm Engines, Motors, Heating, Lighting, &c.," by F. B. Wright. This work is well worthy of perusal, is profusely illustrated, and deals with every phase of the business and science of distilling from various farm products, such as potatoes, barley, wheat, maize, rice, beets, molasses, &c. The book is published at 4s. 6d. net, and can be had from any of the leading booksellers in the Australasian colonies, or from the agent, Geo. W. Kettlewell, 273 George street, Sydney.

Times of Sunrise and Sunset at Brisbane, 1908.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·56	6·45	5·20	6·42	5·41	6·20	5·57	5·46
2	4·57	6·46	5·21	6·42	5·41	6·19	5·58	5·45
3	4·58	6·46	5·22	6·41	5·42	6·18	5·58	5·44
4	4·58	6·46	5·23	6·41	5·43	6·17	5·59	5·43
5	4·59	6·46	5·23	6·40	5·43	6·16	6·0	5·41
6	5·0	6·47	5·24	6·40	5·44	6·15	6·0	5·40
7	5·0	6·47	5·25	6·39	5·44	6·14	6·1	5·39
8	5·1	6·47	5·26	6·38	5·45	6·13	6·1	5·38
9	5·2	6·47	5·26	6·38	5·45	6·11	6·2	5·37
10	5·2	6·47	5·27	6·37	5·46	6·10	6·2	5·36
11	5·3	6·47	5·28	6·36	5·46	6·9	6·3	5·35
12	5·4	6·47	5·29	6·36	5·47	6·8	6·3	5·34
13	5·5	6·47	5·29	6·35	5·47	6·7	6·4	5·33
14	5·6	6·47	5·30	6·34	5·48	6·6	6·4	5·32
15	5·6	6·47	5·31	6·33	5·49	6·5	6·5	5·31
16	5·7	6·47	5·31	6·33	5·49	6·4	6·5	5·30
17	5·8	6·47	5·32	6·32	5·50	6·3	6·6	5·29
18	5·9	6·47	5·33	6·31	5·50	6·2	6·6	5·28
19	5·10	6·47	5·34	6·30	5·51	6·1	6·7	5·27
20	5·10	6·47	5·34	6·29	5·52	5·59	6·7	5·26
21	5·11	6·46	5·35	6·28	5·52	5·58	6·8	5·25
22	5·12	6·46	5·36	6·28	5·53	5·57	6·8	5·24
23	5·13	6·46	5·36	6·27	5·53	5·56	6·9	5·23
24	5·14	6·46	5·37	6·26	5·54	5·55	6·9	5·22
25	5·14	6·45	5·38	6·25	5·54	5·54	6·10	5·21
26	5·15	6·45	5·38	6·24	5·54	5·53	6·11	5·20
27	5·16	6·45	5·39	6·23	5·55	5·52	6·11	5·20
28	5·17	6·44	5·39	6·22	5·55	5·50	6·12	5·19
29	5·18	6·44	5·40	6·21	5·56	5·49	6·12	5·18
30	5·19	6·43	...	...	5·56	5·48	6·13	5·17
31	5·19	6·43	...	...	5·57	5·47	...	...

PHASES OF THE MOON.

		H.	M.
4 Jan.	● New Moon	7	43 a.m.
10 „	☾ First Quarter	11	53 p.m.
18 „	○ Full Moon	11	37 „
27 „	☽ Last Quarter	1	1 a.m.
2 Feb.	● New Moon	6	36 p.m.
9 „	☾ First Quarter	2	27 „
17 „	○ Full Moon	7	5 „
25 „	☽ Last Quarter	1	24 „
3 Mar.	● New Moon	4	57 a.m.
10 „	☾ First Quarter	7	42 „
18 „	○ Full Moon	0	28 p.m.
25 „	☽ Last Quarter	10	32 „
1 Apr.	● New Moon	3	2 p.m.
9 „	☾ First Quarter	2	32 a.m.
17 „	○ Full Moon	2	55 „
24 „	☽ Last Quarter	5	7 „

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	DECEMBER. Prices.
Apples, Eating, Local, per packer	4s. to 6s.
Apples, Cooking, Local, per packer	8s.
Apples, Tasmanian, Cooking	14s.
Apricots, Local, per packer	4s. to 4s. 6d.
Bananas, per dozen	$2\frac{1}{2}$d. to 4d.
Bananas, Local, per bunch	...
Cherries, per quarter-case	3s. to 7s. 6d.
Custard Apples, per quarter-case	...
Grapes, per lb.	4d. to $7\frac{1}{2}$d.
Lemons, Local, per packer	6s.
Mangoes, per case	4s. to 6s.
Nectarines, per quarter-case	...
Oranges, per packer	9s. 6d.
Papaw Apples, per case	...
Passion Fruit, per quarter-case	2s. to 3s.
Peaches, per case	1s. 6d. to 2s. 6d.
Peanuts, per lb.	...
Pears, Imported, per case	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	6d. to 2s. 6d.
Pineapples (smooth leaf), per dozen	3s. 6d.
Plums, quarter-case	2s. 6d. to 5s. 6d.
Quinces, per case	...
Rockmelons, (large), per dozen	4s. to 5s. 9d.
Rosellas, per bag	...
Rosellas, per quarter-case	...
Strawberries, per tray	...
Tomatoes, per quarter-case	9d. to 2s. 8d.
Watermelons, (large), per dozen	8s. to 10s. 6d.
SOUTHERN FRUIT MARKET.	
Apples, Tasmanian, per case	...
,, American, per case	...
Apricots, per quarter-case	...
Bananas, Fiji, per case	13s. to 13s. 6d.
,, ,, per bunch	4s. to 7s.
,, Queensland, per bunch	2s. 6d. to 6s. 6d.
,, ,, per case	12s. 6d. to 13s.
Cherries, per quarter-case	...
Gooseberries, Tasmanian, per quarter-case	...
Lemons, Ordinary, per gin case	...
Loquats, per box	...
Mangoes, Queensland, per case	3s. to 5s.
Mandarins, Queensland, in Melbourne, per case	...
Oranges, Queensland, in Melbourne, per case	...
Oranges, Common, per case	...
Oranges, Navel, per case	...
Pears, Victorian Vicars, per box	...
Passion Fruit, per quarter-case	4s. to 5s.
Peaches, per case	...
Pineapples, Queensland Queen's	8s. to 10s.
Pineapples, Choice (Common)	8s. to 10s.
Pineapples, Medium	5s. to 7s.
Tomatoes, Choice Queensland, per quarter-case	3s. to 4s. 6d.
Tomatoes, Others, per quarter-case	2s. to 3s.
Watermelons, Queensland (large), per dozen	15s. to 18s.
Watermelons, (small), per dozen	8s. to 10s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER.

Article.		DECEMBER. Prices.
Bacon, Pineapple	lb.	$8\frac{1}{2}$d. to 10d.
Bran	ton	£6 5s. to £6 10s.
Butter, Factory	lb.	11d.
Chaff, Mixed	ton	£6 to £6 5s.
Chaff, Oaten	"	£6 5s. to £6 10s.
Chaff, Lucerne	"	£3 10s. to £5 10s.
Chaff, Wheaten	"	£4 10s. to £5 10s.
Cheese	lb.	$7\frac{3}{4}$d. to $8\frac{1}{2}$d.
Flour	ton	£11 10s. to £12.
Hay, Oaten	"	£7 10s. to £8.
Hay, Lucerne	"	£2 15s. to £4 10s.
Honey	lb.	$1\frac{3}{4}$d. to $2\frac{1}{2}$d.
Maize	bush.	4s. 9d. to 5s. 1d.
Oats	"	3s. 7d. to 3s. 9d.
Pollard	ton	£6 5s. to £6 10s.
Potatoes	"	£5 to £11 10s.
Potatoes, Sweet	"	...
Pumpkins	"	...
Wheat, Milling	bush.	...
Wheat, Chick	"	4s. 10d. to 5s.
Onions	ton	£5 10s. to £12.
Hams	lb.	1s. $0\frac{1}{2}$d. to 1s. 1d.
Eggs	doz.	7d. to 9d.
Fowls	pair	2s. 8d. to 4s. 4d.
Geese	"	...
Ducks, English	"	3s. 4d. to 4s.
Ducks, Muscovy	"	4s. to 6s.
Turkeys (Hens)	"	...
Turkeys (Gobblers)	"	23s. 3d.

ENOGGERA SALEYARDS.

Animal.	NOVEMBER. Prices.
Bullocks	£9 10s. to £12 7s. 6d.
" (Extra)	...
Cows	£7 10s. to £9 7s. 6d.
Merino Wethers	24s.
C.B. "	21s. 9d.
Merino Ewes	19s. 6d.
C.B. "	19s. 9d.
Lambs (Extra)	20s. 6d.
"	14s. 9d.
Pigs (Slips)	8s. 9d.

Farm and Garden Notes for February.

FIELD.—The land intended for potatoes should now be ready for planting. Plant sound small potatoes, well shot, without cutting them. If large potatoes are cut into setts, there is a risk of their rotting, as the usual wet weather may be expected, with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, Kafir corn, imphee, sorghum, and vetches may be sown, but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop sow swede turnips and mangel-wurzels.

KITCHEN GARDEN.—Make preparations for good crops of vegetables for the early winter by ploughing or digging all unoccupied land, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser if prepared as follows:—

Spread a layer of black soil on the ground. Dump the fowl manure on to this and pound it fine with the back of a spade; add hardwood ashes so that the compound shall contain: Soil, 3 bushels, fowl manure, 2 bushels; ashes, 1 bushel. Mix thoroughly, and a little before planting moisten the heap with water, or, better still, with urine; cover with old mats, and let it lie till needed.

Most market gardeners will have cabbages and cauliflowers ready for transplanting. Do this during the month. Read the article in the December number of the Journal, on the growing of cabbages and cauliflowers, in which it is recommended to sow the seed from the middle of January to the middle of March, arranging the time, however, to suit early and late districts. For winter crops the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, are the most profitable. The Savoy cabbage does well here. The best cauliflowers to grow are the Large Asiatic, Eclipse, Early Dwarf, and Le Normand. If the aphis appears, spray with tobacco solution.

Sow French beans, butter beans, beet, carrot, turnip, radish, cabbage, cauliflower, cress, peas. Should the weather prove dry after the January rains, give the plants a good soaking with water. Gather all fruit of cucumbers, melons, French and other beans, and tomatoes as they ripen, to ensure the continued production of the vines and plants.

FLOWER GARDEN.—Thin out, and tie up dahlias. Keep the weeds down, and never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, aster, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemum, verbenas, petunias, penstamens, &c. Dianthus, sown now and planted out in March, will bloom during the whole year if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep, as on the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should be covered with fine soil to a depth equal to their own size—for instance, a pea is about one-eighth of an inch in diameter—therefore, cover it with one-eighth of an inch of soil.

Orchard Notes for February.

BY ALBERT H. BENSON, M.R.A.C.

In order that the series of Monthly Notes that have appeared for some years past in the "Agricultural Journal" may be of more value to our fruit-growers, I take the advantage of this, the commencement of a new year and new volume of the Journal, to revise them and bring them up to date. At the same time I purpose altering the notes somewhat, as, instead of making them of a general nature, applicable to the whole of the State, I will endeavour to localise them to a certain extent, as, in my opinion, although the general principles of cultivation, manuring, pruning, treatment of fruit pests, as well as of the handling and marketing of the fruit, are applicable to the State as a whole, there are many matters that are of interest to individual parts of the State rather than to the whole State; and, further, notes that are applicable to the Southern part of the State for one month are not always applicable to the North for the same month.

In order to carry out this idea, I propose to divide the State as follows:—

1. The Southern Coast Districts, south of the Tropic of Capricorn.
2. The Tropical Coast Districts.
3. The Southern and Central Tablelands.

THE SOUTHERN COAST DISTRICTS.

The earlier summer fruits, including grapes, will be pretty well over, but pineapples, mangoes, and bananas are in full fruit. The bulk of the main summer crop of pines ripens during the month, and growers are in consequence kept very busy sending them to both our local markets and canneries and to the Southern States. The planting of all kinds of tropical fruits can be continued where necessary, though earlier planting of both pines and bananas is to be recommended. Still, if the land is thoroughly prepared—viz., well and deeply worked—they can be planted with safety, and will become well established before winter. The month is usually a wet one, and both tree and weed growth is excessive. If unable to get on the land with horses to keep down weed growth, use the scythe freely in the orchard before weeds seed, as by doing so you will form a good mulch that will tend to prevent the soil washing, and that, when ploughed in later on, will add a considerable quantity of organic matter to the soil, thus tending to improve its mechanical condition, its power of absorbing and retaining moisture as well as to increase its nitrogen contents.

This is the last month of the year in which to bud mangoes in the Brisbane district. The bark of the stock to be budded must run very freely, and the scion when placed in position must be tied very firmly. The bark of the scion should be slightly thicker than the bark of the stock, so that the material used to tie it keeps it firmly in its place. As soon as the bud is tied, ringbark the stock just above the bud, so as to force the sap of the stock into the scion, so that a union will take place quickly.

Where cyaniding of citrus and other trees has not been concluded, it may be continued during the month, as fruit treated soon will probably keep clean and free from scale insects till gathered. If the trees have been treated with Bordeaux mixture, do not cyanide, as cyaniding should always be done previous to spraying with Bordeaux mixture.

If Maori is showing, spray with the sulphide of soda wash. Look out for Black Brand, and also for the Yellow Peach moth towards the end of the month in the earlier districts. Spraying with Bordeaux mixture is advisable in the case of both of these pests.

Get land ready for strawberry planting, so as to be ready to set out runners next month. Some growers set out plants as early as the end of February, but I prefer March. Citrus and deciduous trees can still be budded during the month. Young trees in nursery should be kept clean and attended to; ties should be cut when necessary, and the young trees trained to a straight single stem.

THE TROPICAL COAST DISTRICTS.

As the month is usually a very wet one in this part of the State, very little work can be done in the orchard other than keeping down excessive weed growth by means of a scythe. When citrus trees are making excessive growth and throwing out large numbers of water shoots, the latter should be cut away, otherwise they are apt to rob the rest of the tree and thus injure it considerably. Many of the citrus trees will come into a second blooming during the month, and this will produce a crop of fruit ripening towards the end of winter and during the following spring. The main crop, when same has set in spring, will be ripening towards the end of the month, but, as a rule, insect life of all kinds is so prevalent at this time of year that the bulk of the fruit is destroyed. Where there is sound fruit, however, it will pay to look after. If the weather is wet, the fruit should be artificially dried before packing, but if there are periods of sunshine then the fruit can be cut and laid out on boards or slabs in the sun, so that the extra moisture of the skin can be dried out. Care will have to be taken not to sun-scald the fruit or to dry it too much, all that is required is to evaporate the surplus moisture from the skin so that the fruit will not speck when packed.

Tropical fruits of all sorts can be planted during the month. Budding of mangoes and other fruits can be continued. Bananas must be kept netted, as fly is always bad at this time of year.

SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of apples, pears, plums, peaches, and nectarines will occupy the attention of the Stanthorpe growers. The grape harvest will also extend right through the month. Every care should be taken to see that the fruit fly and Codling moth are not allowed to spread, although the best work in fighting these pests has to be done during the months of December and January, as on the action then taken, if carried out systematically, the freedom of the later fruits from infestation mainly depends.

Handle the fruit carefully, and see that no fly or Codling moth infested fruit leaves the district. The grapes, ripening as they do when this fruit is over in the earlier parts of the State, should be sent not only to Brisbane but to all other parts of the State. For long shipment nothing can beat crates holding six 6-lb. baskets. The fruit should be gathered some hours before packing, and be placed in the sun so as to become thoroughly dry and to allow the stems to become wilted, as this causes the fruit to hang on the bunch much better, and consequently to reach its destination in better order.

If parrots and flying foxes are troublesome, organised shooting parties or poisoning with strychnine are the best means of dealing with these pests.

The crop of grapes will be about over in the Roma and other inland districts. Citrus trees, where infested by red scale, should be cyanided. The orchard should be kept well cultivated after every rain, and when there is no rain but water is available for irrigation, if the soil requires it, the trees should get a good soaking, which, if followed by thorough cultivation, will carry them on till the fruit is ripe.

Agriculture.

No. 4.—MARKET GARDENING.

By A. J. BOYD.

Leeks and Eschalots.

To grow leeks successfully, the soil must be rich, deep, well dug, and manured with well-decomposed manure. Sow the seed in April and May, in drills 6 inches apart and ½-inch deep. When about 8 inches high, transplant them into a bed previously prepared for them by being deeply dug and heavily manured. Shorten the roots to about 1 inch from the plant, and cut off 2 inches or more from the extremity of the leaves. Make drills 15 inches apart and 6 inches deep, and plant them with a dibble deep in the bottom of the drill, nearly up to the leaves, at a distance of 8 inches apart. Cut back the leaves once a month during their growth, to make their necks swell out. As the plants grow, level down the soil in the drills. By earthing up judiciously, and giving copious supplies of liquid manure, leeks may be had of 3 lb. weight, with over 1 foot of beautifully blanched stem.

The finest leek in cultivation, both for exhibition and table, is the Holborn Model; Lyon and Musselburg are also very excellent varieties.

Manure for Leeks: Well-rotted stable manure, or, if this be not plentiful, a little dung mixed with 4 to 6 cwt. of superphosphate, 1 cwt. of sulphate of potash (or 4 cwt. of kainit), and 4 cwt. of nitrate of soda.

Quantity of seed per acre: About 4 lb.

Leeks mature in from 100 to 120 days.

Eschalots.

Eschalots may be grown throughout the year without any difficulty by dividing the roots. They should be planted in rich sandy soil, in the same way as onions. The best way is to plant them on the top of small ridges, so that the roots only will be in the ground, whilst the bulbs, being on the surface, will develop like small onions.

Artichokes.

Globe Artichokes.—Two kinds of artichokes are grown by market gardeners—viz., the Globe Artichoke and the Jerusalem Artichoke. The former variety is grown in vast quantities in France, and also in some parts of Belgium and Germany, where it is much appreciated as a table vegetable. In Queensland it is rarely seen in market gardens, and seldom or never finds its way to the produce markets.

The Globe Artichoke may be raised from seed or propagated by suckers. Sow the seed in autumn or early spring (April or September), in beds of light soil, and transplant in the following autumn or spring, in rows from 3 to 4 feet between the plants, the rows being from 4 to 6 feet apart. This wide planting is necessitated by the wide-spreading habit of the plant. The soil need not be highly manured.

The Globe Artichoke occupies the ground for 180 days. In about four months after transplanting, the flower head appears in the form of a gigantic Scotch thistle. The head should be cut before it bursts into flower.

When the plant is propagated by suckers, the latter should be about 10 inches high. Plant them in rows as directed above, and shade them with pots or bushes until they have begun to grow. In October remove all small suckers and mulch the ground with dung, 3 inches thick between the rows. In the absence of dung, use grass mowings.

A bed of artichokes will last about five years, when it should be dug up and a fresh plantation made.

Early in the spring of each year dress the beds with fine wood or coal ashes. Dig this in, and then give a heavy dressing of stable manure.

Artichoke Chards.—After the fruiting season in October or November, cut away the leaves and stems of some of the plants to within 6 inches of the ground. This will have the effect of causing a number of young shoots to appear. When these have grown to a height of about 6 or 8 inches, draw the leaves together and tie them up in the same way as is done with Cos lettuce. They will be nicely blanched in a month.

Jerusalem Artichokes.—This valuable plant seems to be little known in Queensland, and still less grown and used, and yet it is a most excellent esculent for man as well as a first-class feed for domestic animals. The stems, leaves, and flowers bear a great resemblance to the well-known sunflower of the same family.

The plant is propagated by tubers instead of seed. It is not at all exacting as regards soil, and will grow in almost any situation, excepting low-lying ill-drained soils. The best crops are obtained from rich, friable, sandy loams. The cultivation is extremely simple, and does not require any extra care or skill. The land should be treated as for potatoes—that is, deeply ploughed and thoroughly pulverised. The tubers are planted 3 feet apart each way, and not too deep. No hilling up is needed. The tubers are very difficult to eradicate, consequently they should be put in some situation where they are not likely to prove troublesome.

Three or four bags of tubers will plant an acre.

The tubers will be ready for digging in from 150 to 180 days.

ASPARAGUS.

Up to a very late period it was considered that, to grow asparagus successfully, it was necessary to dig a deep pit and fill it full of manure, sowing the seed or planting the crowns on the surface. This idea has long since been exploded. To grow asparagus, no such pit is necessary. If the bed is well dug or trenched and well manured, this is all that is needed.

From the time of sowing the seed, it takes three years to bring an asparagus bed into full bearing; therefore, the best and quickest method of establishing a bed is to plant the crowns, which may be always obtained at a nurseryman's.

Trench the bed to a depth of 2 or more feet. If the subsoil be of a dense, stiff nature, break it well up with a pick, and incorporate with it yard manure, half-rotten straw, bones, &c. Replace the top soil, mixing it with old manure (horse or cow), adding a good sprinkling of coarse salt. Now leave the bed for a month or two, to allow the rain and the atmosphere to act upon it. Before planting, the ground should have another good dressing of well-rotted manure, be trenched again 2 feet to 2 feet 6 inches deep, and be again well sprinkled with salt, leaving the surface level as the work proceeds.

The best time to plant asparagus is during the months of June and July. The growing season commences in October, and extends right into March or April.

Planting: Mark out the beds 4 feet wide, with paths 2 feet wide between them. Then draw out three rows, each 15 inches from the other, and put in the crowns, 15 inches apart, carefully spreading out the roots and leaving the crowns 2 inches below the surface. Fill in the earth as quickly as possible to avoid all unnecessary exposure. After planting, mulch the rows with stable manure to a depth of 6 or 9 inches, and water liberally until the plants are established. About the last week in October (in early districts, in September) the young shoots will begin to force their way through the soil. As soon as they are 2 or 3 inches above ground, they should be cut for use, taking care to always cut well down under the surface of the ground. The cutting must be done regularly during the season of six or eight weeks, and never allow, during that time, any shoots to develop. When the season is over, allow the plants to make their natural growth, taking care not to allow any seed to ripen and drop. When the tops begin to turn yellow in the autumn, cut them down

level with the ground, and again mulch with manure, salt, or kainit, forking the surface before applying it.

A bed of asparagus, attended to as here directed, will last for seven years, and bear well during the spring and early summer. Two rows, 30 feet long, will suffice for an ordinary family.

Plants raised from seed will require four seasons before becoming productive, whilst those raised from crowns will afford a cutting in the second season—that is to say, in fifteen months.

CRESS.

The Curled Cress is the best variety to sow. Select a light rich soil; sow thickly. See that it has abundant moisture and shade. If no shady spot can be found in the garden, cover them over with boughs, so as to draw the plants and make them crisp. They will be ready to cut in from 30 to 40 days. Mustard may be sown with cress, if sown two weeks later. Both may be cut when 3 inches high.

WATERCRESS.

If your garden lies on the bank of a fresh-water creek, watercress can easily be raised from seed; or, if no such stream is available, it may be grown with very little trouble in the garden.

To raise seedlings or cuttings, take a box, bore some holes in the bottom to allow of the escape of stagnant water; set it in a shady place; put 2 inches of charcoal or other rough substance in the bottom; add 6 inches of compost, made of equal parts of well-decomposed cow dung and sand; make the surface quite smooth, and water copiously. When quite drained off, sprinkle the seed evenly over the soil, and sift a small quantity of sand over all, so as just to cover the seed. Keep the soil regularly watered with a fine-rose watering pot. Never let the surface get dry. As the plants get large enough to handle, they may be planted out 3 inches apart in a rich, well-sheltered bed, and watered regularly and abundantly until large enough to be planted out in their permanent positions. They may then be increased to any extent by cuttings, under similar treatment. After the final planting out, the salad will be fit to cut in about two months.

CUCUMBERS.

The cucumber is not very particular as to soil, so that it be light, rich, and loamy; it may be nearly all sand, provided that good rich manure be added, and that it be deeply dug. The cucumber bed should be sheltered from the westerly winds. The pits, or, as some call them, hills, should be made ready in August, in the following manner:—

Mark off the land in 6-feet squares, and at each intersection make a hole 2 feet in diameter. If the soil be not naturally rich, mix with it a compost made up of well-rotted stable manure, sheep or poultry dung, wood ashes, bonedust (if procurable), and a little salt. Fill up the hole with this prepared soil, and sow five or six seeds in it in a ring. Half an inch is deep enough for the seeds. When they are up, take out all but two plants in each hill. Stop all lateral runners as soon as they show fruit, and the secondary runners must be pinched back to the fruit in the same manner. If the weather is dry, give the beds a good soaking with diluted liquid manure about once a week. Water every evening sufficiently to damp the soil right down to the roots.

Make successive sowings during September, October, and November. To produce straight cucumbers, place under them three-sided boxes, 3 inches wide, with the open side uppermost.

A good way of watering cucumbers to ensure the water reaching the roots is, as soon as they show signs of running, to dig a hole large enough to hold a quart can, as near the roots as possible. Make holes in the bottom of the can, and place it in the holes near the roots of the plants. Put the cans in the ground, about 2 inches deep, and fill them with water every other day.

The choicest cucumber in cultivation is Lockie's Perfection. Early White Spine, Early Ridge Gladiator, and Long Prickly are also good marketing and table varieties.

Cucumbers are ready for market in from 75 to 105 days.

WEST INDIAN GHERKINS, AND THE SHORT PRICKLY CUCUMBERS.

These are used for pickling. The cultivation is the same as for other varieties. A new cucumber—the Chinese—has lately been introduced in Brisbane. The fruit is as round as an apple, and about 2 to 2½ inches in diameter. It is crisp, tender, and of delicate flavour. The vines bear heavily.

MELONS.

Melons will grow, after a fashion, on most soils, but a fairly rich, loamy soil, resting on a stiff subsoil, is about the best suited to its nature. Very fine melons, including the Rock, Water, Sugar, and Champagne varieties, are grown in quantities on our light scrub soils.

The cultivation of melons is the same as that of cucumbers. As the vines begin to run, it will be noticed that they do so with greater rapidity, and the runners look most healthy and succulent, when they make their way over some particularly rich patch or over a manure heap. The reason for this is that the rootlets emanating from the vines find their way into the rich humus, and extract nourishment, which is thus conveyed direct to the young vine. It is the same with pumpkins and cucumbers; hence, when preparing for melon-sowing, it is always well to spread a light coating of farmyard manure over the soil the vines will probably cover. When sowing, the seed should not be covered with more than an inch of soil. In dry weather, plentiful watering must be given to the vines, but no stagnant water must lie about the roots, or the plants will not thrive.

Sow in August and September, and, for succession, up to and including October. The fruit matures in from 100 to 180 days.

To ascertain when a melon is ripe, tap it with the knuckles, and, if a hollow drum-like sound is heard, the melon is ripe. This only refers to water melons.

Good varieties are—Black Spanish, Ice Cream, Mammoth Champion. Amongst the best rock melons are—Skillman's Netted, Yellow Cantaloupe, Hackensack, Emerald Gem, and Large Persian.

Pie melons, for making jam and as a substitute for apples, are cultivated in the same manner as the above.

PUMPKINS, SQUASHES, AND VEGETABLE MARROWS.

These are all cultivated in the same manner and sown at the same season of the year as melons and cucumbers. The only difference is that they require much more space, owing to their more vigorous growth. The holes should be 8 feet apart, instead of 6 feet, and only one plant of pumpkins in each. In the case of custard marrows, two plants may be left. Pumpkins come to maturity in from 130 to 150 days; vegetable marrows in from 75 to 105 days.

EGG PLANT.

This excellent vegetable, called indifferently Egg Fruit, Bringal, and Aubergine, is another of those vegetables which are rarely grown in Queensland. It is as hardy and as easy to grow as the tomato, to which it is allied, both belonging to the order *Solanum*.

The purple variety is the kind most usually grown for the table. The fruit should be picked before it loses its brilliant hue.

Sow the seed in September, in a warm spot, and thin out when large enough to 2 feet apart. The plants removed may be planted out elsewhere.

The best varieties are—New York Purple, Long Purple, Black Pekin.

The nicest way to cook the egg fruit is to boil it for twenty minutes, then to slice and fry it, adding pepper and salt.

TOMATOES.

The tomato being a gross feeder, the soil in which to grow it can hardly be too rich, especially in lime, potash, and phosphoric acid. A perfect tomato soil is a rich sandy loam, well drained, deeply ploughed, and subsoiled. Sow the seed in August and September, and, when the plants are about 6 inches high, thin them out to about 3 feet apart, and put up a light trellis to train them on. The plants which have been taken out may be planted in some other part of the garden. Before planting out, clip all the leaves off except the top bud. The plants so treated will start to grow immediately, because they are not obliged to expend their energy in trying to revive the dying leaves. The plants will bear a month earlier.

When the first fruit forms, stop the plant by pinching off the ends of the shoots.

A very good plan to train tomatoes is to erect a framework of hardwood pegs, 18 inches above the ground, nail hardwood battens on the top, and stretch wire netting across it. The young vines must be properly guided and trained through the meshes, and not be allowed to fall back again. When the vines are full grown, the top of the netting is a complete mass of fruit and leaves, and all the fruit is clean.

Tomatoes may also be trained on stakes. As soon as the planting is completed, a split stake, 5 feet in length, is firmly set at each plant, and about the time the fruit is setting each plant is tied with common cord. The string is tied firmly round the stake, and loosely about the stem of the plant, so as not to interfere with its growth. Care must also be taken not to allow the fruit to cluster, so as to rub against the stake.

The sprouts or auxiliaries will grow very rapidly, and must be constantly pinched off. Three tyings are usually necessary up to the time when five good clusters of fruit have set. When these aggregate 20 or 25 tomatoes, the top is pinched off, and the whole strength of the plants is centred in the production of firm, bright, smooth tomatoes, of good and uniform size. Pinching back the suckers tends to increase the size of the leaves, making shade for the fruit. Constant systematic pruning forces the plant into fruiting; therefore, carefully remove all suckers.

Tomatoes mature in three or four months, according to the soil, season, and climate.

Manure for Tomatoes: It is a prevalent idea that the tomato will not stand heavy manuring. This is only true of the crop after the fruit has set. In the early stages of development, nitrogen, phosphoric acid, and potash may be liberally supplied with advantage, but, after the fruit has set, manuring with farmyard manure or other stimulating fertilisers delays the development and ripening of the fruit.

A good manure is made up as follows:—

2 parts of nitrate of soda;
2 parts of bonemeal;
3 parts of kainit;
4 parts of superphosphate.

Of this mixture, 1 oz. per square yard of soil may be applied weekly, from the time that the plants are established till the fruit has set. Superphosphate has been found to hasten the maturing of the fruit.

SEA KALE.

The cultivation of sea kale is much the same as for rhubarb, as will be described later on. The ground must be deeply trenched and heavily manured. As a dressing for autumn, a sprinkling of salt is very desirable. Obtain strong two-year-old roots, and plant three together, 3 feet apart in the beds. Early in the second season of their growth they should be covered over with earthenware pots or boxes. If pots are used, cork up the hole in the bottom, and draw soil round to keep out all light. This will cause them to blanch,

as it is only in this state that they are used. When the plants are 8 or 10 inches high, they may be cut for the table. As soon as the full cutting has been made, clear away the covering to allow the plants to make their natural growth and recover themselves for another season.

Sow seeds, or plant roots, in August and September.

SPINACH.

Of the two varieties of spinach (the round and the prickly) grown for market, the prickly is the more hardy. For this reason, the latter is generally sown for the winter crop, and the round for summer crops.

The ground for spinach must be worked deep, and, as quick growth is necessary, the soil cannot be to rich. Sow the seeds in rows about 1 foot apart (some prefer the rows 2 feet apart). When the young plants have made four or six leaves, thin them out to from 9 to 12 inches apart. While growing, plenty of water is required to bring the crop to perfection, and the ground must be kept free from weeds.

Sow the prickly from March to May, and the round in August and September. Guano, lime, and salt are excellent for this crop.

The leaves will be ready for cutting in from 80 to 100 days from sowing.

RHUBARB.

Rhubarb may be grown on almost any well-drained soil, but a rich deep loam yields the best product. The soil must be both rich and deep, and the deeper it is the quicker will be the growth. The bed ought to be trenched to a depth of 2 feet, and very heavily manured with good stable manure mixed with cowyard manure.

To grow the plants from seed, a well-manured seed bed should be prepared, and the seed sown in August or September, in drills about 1 foot apart. The young plants will require plenty of water in dry weather, and a light shade will also be beneficial to their growth. Thin out the plants to about 6 inches apart, and let them remain in the seed bed until the following spring, when they can be transferred to the permanent stand. The rows should not be less than 4 feet apart, and the plants at least 3 feet apart in the rows. During the first year the space between the rows may be utilised for growing lettuce or any other low-growing vegetables, but after that the plants will require the whole of the room for their full development. The ground should be kept well cultivated and free from weeds, and all flower stalks should be cut off as soon as they appear, in order that the plants may not exhaust themselves by forming seed.

In the winter of each year a heavy top dressing of coarse manure should be applied, and this must be carefully forked in in the spring, care being taken that the roots are not broken or disturbed in any way. No stalks should be used until the second year, and if left until the third the plants will be all the better. No plant responds more liberally to judicious watering than rhubarb, and in dry weather irrigation gives surprising results in the way of increased yield and general vigour of the plants. Water should be vigorously used when necessary, but at the same time it is well not to over-do it, and thus make the ground sodden. Liquid manure, applied occasionally, is also of great benefit.

Instead of raising the plants from seed, which is a rather slow process, it is often more convenient to plant "crowns"—that is, roots—one or, preferably, two years old. These, planted in the same manner as the seedlings, when set out in permanent beds, come on very quickly. Such crowns, if planted in July or August, begin to grow at once, and in September the stalks from them are ready for use.

By purchasing crowns, therefore, you can have rhubarb fit to use in two months instead of having to wait for two years for seedlings to come to maturity. It will be found more profitable to purchase strong sturdy crowns, and renew them every third year, than to go to the trouble of raising seedlings, which will probably not be very strong or vigorous.

AFRICAN WONDER GRASS (*PANICUM SPECTABILE*).

We have received from Mr. B. Harrison, Burrington, Tweed River, New South Wales, the following account of a new fodder grass, which was originally introduced into Western Australia, and which has apparently worked its way into favour at the Experimental Farm at Bathurst, New South Wales. The writer says that it is too coarse for hay. That seems to us to be a disadvantage. When the Johnson grass was introduced into this State, it was lauded to the skies as a wonderful fodder grass, and no doubt it is an excellent grass for stock when young and succulent; but it had two faults at least. One was, that it was too coarse for hay; the other, that once it was sown in a field it speedily took possession of the land, and not only became exceedingly difficult to eradicate, but rapidly spread to the neighbouring lucerne fields, where it was not long before it overpowered the more valuable crop. In all cases of new grasses we would advise caution, and an application to the Colonial Botanist, Mr. F. M. Bailey, for his opinion on its habits. In this State we have had bitter experience of the introduction of new plants of reputed great economic value, which have been afterwards proved to have been rather a curse than a blessing.

Mr. Harrison says of this grass:—

This is the heaviest yielding grass in Australia, and it has also proved one of the best drought-resisting species. To those who own poor soil or live in the dry districts, it should prove a great boon. It is readily propagated from roots or portions of the procumbent stem, which roots freely at the joints. When well established, it forms a mass of the richest green foliage, about 5 or 6 feet high, gradually lowering to the outer border, where a network of shoots and runners cover the ground; it roots at the joints, and sends up then a mass of the softest and most luscious fodder. It is one of the best pasture grasses we have in Australia, and it should also make good ensilage, but is rather too coarse for hay. It is spoken of in the highest terms of praise by all those who have grown it, on account of its rapid and luxuriant growth. A writer in the "W. A. Journal of Agriculture" says:—"As a result of numerous experiments, the African Wonder grass has proved the best of all the grasses yet introduced to the State; it has succeeded in almost every place where it has been tried, both in dry and moist situations, and the introduction of this grass for the stock-breeders of this State is worth several times over all the money that has been spent for grass seeds and experimenting with grasses during the last few years." At the Bathurst (N.S.W.) Experimental Farm "this grass has proved a vigorous grower, is unaffected by frosts, and sheep like it well." This grass has been grown at several of the W.A. experimental farms, and "has given most promising results; in fact, it seems to stand the dry weather better than any grass we have yet had growing. From reports received it appears to be doing equally well in sandy and clayey land, and also in dry places." This grass grows most luxuriantly, and, as well as the upright growth, it sends out long lateral stems, which form fresh roots at the joints or nodules, and cause the grass to spread quickly.

THE PRICE OF WOOL.

The question of the price of wool not only affects the owners of large flocks, but even, in a greater degree, the grazing farmer, who, on his 20,000-acre grazing selection, is vitally interested in all that concerns the prices of sheep products. It will be pleasant reading for the latter to see what the special Bradford correspondent of "Dalgety's Review" has to say on the high values of wool to-day, as compared with the prices obtained for good wool in 1895. He writes (10th December):—

A great number of consumers of wool in this district cannot for their life understand why wool values should keep on the high level which they are, for

never before has a 2,000,000-bale clip been exported from Australasia at prices anything like where they are to-day. In 1895 we had good wool then at 6d. per lb., whereas to-day the same article is worth 1s. 1d. to 1s. 2d. per lb., and many think that rates to-day are fictitious and unsound. I venture to say that prices are now really resting on a firmer basis than they were in the cheap days of the early nineties. Those were the days of surpluses and when stocks were high, whereas to-day users are on the sheep's back clamouring for its fleece. All along I have strongly maintained that the majority have, during the past twelve months, over-estimated production and under-valued the extent of the world's needs. Some of the best men in the trade, from their constant repetition of the story that wool prices are "dangerous," seem to have totally lost sight of the fact that all along production has not overstepped consumption, and that to-day, with a bigger world's needs than ever, there is not much chance of any substantial ease. Everything, I say, is being determined by big wants that remain still unsatisfied, and if these financial and industrial crises come they will not diminish one iota the requirements of the world. No doubt we shall see a temporary set-back in prices, but, as for altering or minimising the call for wool, that I fail to see. It is high time of the day that pessimists recognised that consumption has all along kept at a quicker pace than production, and that the clip of wool at present being grown no more than satisfies the call for wool-made fabrics.

OBJECT OF APPLYING ARTIFICIAL FERTILISERS.

When a farmer applies a fertiliser to the soil, what does he do it for? He is simply supplying so many pounds of food to his plants, just as he gives rations of fodder to his live stock.

The crop, as it grows, consumes or assimilates, besides other substances, a certain quantity of nitrogen, phosphate of lime, and potash; and when we put on the soil dressings of nitrate of soda, superphosphate, kainit, or other fertilisers, we are providing the crop with a stock of food for the period of its growth.

Thus, a dressing of 1½ cwt. nitrate of soda to the acre furnishes 26 lb. of nitrogen, equivalent to 31 lb. of ammonia; 3 cwt. of superphosphate furnishes 87 lb. of soluble phosphate of lime; 2 cwt. of kainit furnishes 29 lb. of potash.

The following table gives the weight in pounds supplied by 1 cwt. of the principal commercial fertilisers, and will be found useful for reference:—

1 cwt. of sulphate of ammonia contains 27·44 lb. of ammonia, equal to 22·60 lb. of nitrogen.

1 cwt. nitrate of soda contains 17·36 lb. of nitrogen, equal to 21 lb. of ammonia.

1 cwt. kainit contains 14·56 lb. of potash.

1 cwt. sulphate of potash (90 per cent.) contains 55 lb. of potash.

1 cwt. muriate of potash (80 per cent.) contains 56 lb. of potash.

1 cwt. superphosphate (26 per cent.) contains 29·12 lb. of soluble phosphate of lime, equal to 13·27 lb. of soluble phosphoric acid.

1 cwt. superphosphate (36 per cent.) contains 40·32 lb. of soluble phosphate of lime, equal to 18·46 lb. of soluble phosphoric acid.

1 cwt. basic slag (26 per cent.) contains 29·12 lb. of phosphate of lime, equal to 13·27 lb. of phosphoric acid.

1 cwt. basic slag (38 per cent.) contains 42·56 lb. of phosphate of lime, equal to 20 lb. of phosphoric acid.

10 tons farmyard manure, 120 lb. of nitrogen, 115 lb. of potash, 60 lb. of phosphoric acid, chiefly slowly available.—"Mark Lane Express."

Dairying.

DAIRYING INDUSTRY.

COMPREHENSIVE REPORT.

By G. SUTHERLAND THOMSON, Government Dairy Expert.

The passing of the Dairy Produce Acts marked an epoch in the history of agricultural progress, for probably no branch of agronomy in the States of Australia has shown such rapid growth as the dairying industry of Queensland. To review the changes that have taken place in all departments of dairying of recent years would make reading of great interest, and I may be pardoned for giving a brief *résumé* of the improvements effected since I came to the State four years ago. At that period the industry was struggling for a position amongst the Australian States in the manufacture of butter, and, although an export trade was opened up with Great Britain, very feeble headway had been made, for there was no recognised system in the manufacture and classification of produce. It was at once visible to me that Queensland had made a very bad beginning, and the first step towards success was to reorganise the industry on entirely new lines. This necessitated the preparation for the passing of a Dairy Act, which in itself was a heavy task for one person to undertake, but there was no alternative, and my efforts were directed to touring the State and lecturing on the value of such a measure. In all, I delivered over sixty addresses, and it was then I fully recognised what splendid prospects there were in Queensland for the dairy farmer; at the same time, it was evident that the injurious effects of the early teaching of dairying would be a strong barrier against lifting the industry into prominence in the export of dairy produce. At that period there was no such thing as a system of cream grading; everyone had his own ideas of the science and practice of dairying, and did as he thought fit. The classification of butter was little more than talked of, although the Department possessed a set of stamps, which I found it necessary to lock up, as a means of protection against the abuses of the practice of grading then in vogue. There was no grading inspector in the service, and the industry appeared to be drifting any way. Still, it is maintained at the present time amongst some people, that the quality of butter and cheese in those days was superior to what it is now. I can only say that my investigations then revealed a bad state of affairs, for brands of export butter were made up of all grades, and this was borne out by the miserable prices the produce brought in England, and the very poor reputation the State had in the manufacture of an export product of a reliable quality. The question of refrigeration was claiming some attention by shippers, but it was the custom to rail butter at high temperatures in summer, and to put it on board steamer in the same melted condition as it arrived in Brisbane. Milk and cream testing was done in most cases by inexperienced hands, and the knowledge necessary to obtain correct results was not viewed with much concern by factories. But, at the same time, big profits were made, for it was the heyday of the manufacturer, who had as his slave the struggling producer. At last the tide has turned in his favour, and the dairyman's interests are the interests of the State, for assistance is given him to turn the labours of the farm to the best account, and he is protected against the wrongs which were so common in the past.

Now, let the reader follow me along the main channels of progress during the past four years, and see what has been accomplished to raise the status of dairying, and place it on a more uniform basis of profit for the producer and manufacturer.

An Act of Parliament was passed, and, although the measure was robbed of an important clause to make the grading of cream compulsory, it has established the industry on a good footing.

There have been reforms in the handling, collecting, and storing of cream at the farm, depôt, railway station, and factory.

Dairy inspection has proved valuable in improving the source of the milk and cream supply.

Refrigeration at factories, cool cars on the railways, cold storage of produce in Brisbane, and the shipment of butter at low temperatures to oversea markets have returned profits to the farmers. Scientific investigations into taints and defects in produce, and the publication of literature on this and other subjects of practical worth, have added to the success of the industry.

Aids to improvement in milking stock and other departments of practical dairying are noticeable features in the advance of the industry.

Modern methods of testing milk and cream for butter fat, and the thorough investigation of the weaknesses which surrounded the practice, may be reviewed with special favour by every dairyman in Queensland. What now remains to be done to place this important branch of dairying on a satisfactory basis is, to end the bitter competition for the farmers' supplies.

The standardising of all glassware used for testing milk and cream and the inspection of same are progressive steps in the interests of the producer.

The value of science to dairying has not been lost sight of in Queensland, and through its introduction into all branches of the industry, much has been saved to the individual and to the State.

In consideration of all these reforms in dairying, the reader must remember that each had to be fought for, which, in most instances, entailed considerable labour.

I shall now deal with the official report of my inquiries in Britain into agricultural matters, chiefly dairying, in which the grading of butter will be dealt with in full.

INTRODUCTION.

During my term of inspection of Queensland dairy exports in Great Britain, I had the fullest opportunity of ascertaining the chief defects in the quality of the produce, and to what causes the low prices of Queensland butter and cheese were attributed to. My knowledge of the industry in Queensland, and the particular attention I previously had given to grading, enabled me to more readily recognise hurtful conditions in the shipment of butter, and to identify the same with the methods of production commonly adopted throughout the State; and, to succeed in this direction, no better facilities could be offered than the British markets, for there, all evils militating against the selling value of butter and cheese are laid bare.

Not being deputed by the Queensland Government to give attention to the butter trade in London, I left the State on my own initiative, one of my reasons being to confirm the existence of evils which I felt certain were impeding the progress of the industry, and to better my knowledge in branches of dairy science and practice, which otherwise could not be obtained in Australia. Subsequent, however, to my arrival in England, I had the honour of executing, at the instance of the Government, an investigation into the quality of Queensland dairy produce on the London market, and I hope that the knowledge gained of the requirements of the trade and of existing errors in butter and cheese production in this State will be of some benefit to the dairy farmer and manufacturer.

While in London I was struck with the high tribute all sections of the produce trade paid to the dairy legislation of Queensland, and it required

no effort to show that the Queensland Dairy Act had saved the dairyman and the industry from a bad future.

In conclusion, I have much pleasure in thanking the produce firms of London for the splendid assistance they gave me to make the object of my mission a success; also, I feel most grateful to the Agent-General, Sir Horace Tozer, and his staff for the unremitting attention and kindness shown in all that pertained to my inquiries in Great Britain.

DEPARTMENT OF AGRICULTURE AND THE PRODUCER.

The Department of Agriculture has a high duty to perform in guiding the producer to success by protecting him from the possibilities of danger which may impede his progress and discredit the future operations of the farm. To the Department as a reliable source he should look for a solution of the many difficulties which may confront him in the science and practice of his calling. Doubtless the farmer is aware that no branch of agriculture and, perhaps, no industry harbours greater opportunities, and is prone to more weaknesses in the capacity of men to discharge their duties without freedom from error, than that which concerns the manufacture, export, and distribution of butter. It is, therefore, to the best interest of the producer that his connection with the industry should not end in the cheque he receives for his cream, but he should satisfy himself that all precautions are taken to justify him as an earnest supporter of the factory which he is associated with. In vital departments of dairying the farmer's advice is not sought after, and he must, therefore, abide by the decision of his advisers, who are entrusted with the gravest responsibilities in building up a reputation for the deserving farmer, and on which the prosperity and permanency of the industry depend. Let the best judges of the quality of the butter guide him as to the progress of factories, and these are the merchants, grocers, and consumers in oversea countries, who enjoy the unrestricted privileges and freedom to choose the produce of every nation exporting—produce manufactured by skilled men and graded by Government officers, who instruct the producing centres to enforce the utmost care and honesty in all that pertains to the elevation of the industry; and were the producer to stand on the floor of the warehouse of the British importer and see the world's butter and cheese laid bare to be scrutinised by the most alert and proficient of authorities in Britain, he would learn of the lessons which the errors of the industry are costing him. Of the examinations of butter which take place in these warehouses every hour of the day, he would quickly recognise that the proud rivals of Australia for the honours of the British market—Denmark and New Zealand—stand far ahead of any other country in the genuineness of their brands; and in this the buyer, whether wholesale or retail, has infinite faith, because his experience—which is wide and varied—and his customers—who are numerous—tell him so. Let the farmer here ponder, and the veil may be removed from his eyes to show him the light to greater success and higher profits for the labours of the farm. And he should not lose sight of the fact that it is not essentially the proportion of high-class butter that builds up a great name for a country: it is the honesty of the grade, whether first, second, or third, that wins the confidence and patronage of the British; and in this, Queensland has been at fault. And what is responsible for this might be queried. Doubtless the bitter struggle amongst factories for the supremacy of the industry is leaving a dark mark in its trail, and the producer must soon decide what action he should take to gain a firmer hold of the reins to guide the industry to a higher and more successful plane. Of recent months much has been said against the efforts of the Department to put dairying on lines of promise, but perhaps the restrictions of knowledge of the subjects embodied in discussions may be taken to ameliorate the attitude of those in opposition to the Department, and the producer, after due consideration, should have no great difficulty in determining the right from the wrong.

A TOOLEY-STREET SHOW ROOM.

It is natural that those interested in the dairying industry, and particularly the farming community, would wish to know what features are specially noticeable to the visitor when he views the butter floor of a Tooley-street importer. There he can see the chilled produce arrive by the barges which carry it down the Thames direct from the freezing chambers of Australian liners. Everywhere is bustle when the bulky river boats are unloading, and everything can be noted, from the discharging of the slings laden with boxes until the butter is opened up in the merchant's warehouse, examined, sold, and despatched to some provincial town or country village. The doors of the produce firms are open to inquirers; you enter, and see brands of butter from all factories drawn up in lines and ready to be sampled. There one can observe the merchant who has come from some inland town to purchase his requirements, and see him debate the quality with the seller and close the bargain. Again, you may recognise the agent (whose duty it is to buy for a hundred or more shops) carefully test brands of suspicious character, and finally decide to take a proportion of first, second, and third grades, until his orders are filled. These men can tell you of the progress of every country exporting butter, the faults of any brand, and what is required of the factory to improve the output and give the trade greater faith in the produce. But to obtain your information from these buyers is not necessary, for you can personally examine the butter and satisfy yourself of its defects, follow the produce to the shop of the small merchant and country grocer, and hear what they have to say in its favour or against it. This course I carried out in its entirety when in England, and, together with the views given by merchants of all standing, I obtained a good knowledge of the trade and what is required of the State to improve the farmer's position in British markets.

WHAT A BRAND OF BUTTER MEANS.

A brand of butter carries with it the reputation of the factory from whence it came, and it is in London that this very forcibly appeals to one. Standing around a heap of boxes, each with its lid off, the visitor sees butter-graders testing the quality and honesty of brands, for upon these conditions its popularity and prices depend. If all is satisfactory, the brand adds to its good name, and, if this is repeated regularly, the factory producing the butter and the State or country exporting it win the confidence of merchants and their patrons, and thus the foundation of a successful and profitable career is established. But, on the other hand, if the butter is not up to the standard of the factory's choicest brand (which is portrayed with the name of the factory on the boxes), is mixed in quality, and under weight, the reputation of the factory is seriously endangered; and, should this occur several times, merchants will not treat the produce with that confidence which is essential to the success of the factory. And how far does this bad news travel might be queried by the farmer whose future depends on the factory? It is passed from merchant to merchant; and my experience in England has shown me that the finding of such serious defects is frequently made in the shop of the country grocer, with disastrous results to the factory and injury to the State. Several times I have seen the produce of our factories (choicest brands) returned to London, not being up to the standard or guarantee of the factory; and the producer may judge the reasons why Queensland butter does not realise a price in accordance with the best efforts of the intelligent and progressive dairy farmer.

GOVERNMENT STAMP.

And had the visitor to London followed the brands of butter bearing the Government stamp from the barges to the warehouses, he would have probably read a simple lesson of the value of official inspection. But it does not begin or end here. Careful examination conducted by me in London proved

the value of the stamp in describing the quality of the produce, and in this the importer finds safety in his sales, likewise does the grocer, and in turn the consumer is protected. Just imagine for a moment what desultory results would follow if the dairy produce of Queensland, when not true to the factory brand, is put on the market without an official mark to denote the grade. Without the protection which the mark affords, it would not take long to drag the industry back to the miserable place it held five years ago. And here I might again remind the producer that it is fallacy to think that the Government stamp acts as a lever to the buyer to attain greater profits; it is not so, for the manufacturer is virtually compelled to pay a higher figure for produce when it can always be depended upon, and to stamp the butter is to show that the State is acting in the best interests of the farmer, factory, and trade.

For a convincing answer to this I refer the reader to the high and steady prices of New Zealand butter, every box of which is stamped with the grade; and, had the producer accompanied me in my travels in Great Britain, ample scope would have been given him to determine the means of the Dominion's success.

Queensland is gaining that confidence which has made the dairying industry of New Zealand famous, and the dairy farmer has to thank grading for the good it has done in this direction. The anti-grader scorns the marking of boxes with the grade distinctions. He asks for a certificate number to be placed on the boxes instead, which is worthless as a guide to the buyer we at present chiefly depend on—namely, the small merchant and grocer of Great Britain. To revert to this system is to open the door to practise the greatest evils of the industry—gambling and bartering in the sales of the produce; and it is to be hoped that the solicitations of the anti-grader will be carefully considered before an answer is given to his demands.

VALUE OF BUTTER GRADING.

Grading has, without question, done more to uplift the market value of butter than any branch of educational work introduced on behalf of the industry. The institution of the system of grading in Queensland was a big undertaking, and before its beneficial effects were illustrated radical changes had to be made in the manufacture and classing of butter into its respective qualities. The graders had, therefore, a heavy task to perform, and, although they could not, at the outset, stem every abuse current, their good work soon became evident in London and elsewhere. The great worth of compulsory grading to Queensland dairying may be summarised as follows:—

A. It was invaluable in showing what position the industry occupied in the export of produce of good quality.

B. Errors and carelessness in the handling and treatment of milk and cream have been traced through the agencies of grading.

C. Grading has determined the extent of every costly defect in the manufacture of export produce, and has been indispensable to scientific investigations of taints in produce.

D. Evil practices in the classing of cream, manufacture of butter, and incompetency of factory employees to do justice to their work have all been demonstrated by the official inspector of exports.

E. Grading has proved a key to abuses in the purchase of cream, and through its influence valuable reforms have been effected.

F. The carrying properties of butter have been investigated through the introduction of grading, and it claims much towards improvements in the cool storage of butter and cheese.

G. Grading has protected the buyer against the wrongdoings of the export trade, and the confidence of the world's merchants in the honesty of brands has been more firmly established since grading was made compulsory in Queensland.

H. It may also be claimed for grading, the better distribution of butter in oversea markets; and it is safe to assert that higher prices have been obtained for exports through the good effects of inspection.

I. One grand object of grading is to establish honesty in all transactions with butter, as the grade stamp on the box is the hall mark to the quality of its contents.

J. Grading may well be termed the farmer's friend and adviser, and no person should have welcomed the practice more than he.

K. Grading has raised the status of dairying, and it has been a pillar of education to the industry.

PRECAUTIONS TAKEN IN GRADING.

The true value of classing butter is based on the ability of the grader to determine its keeping properties, and to stamp the produce with the grade indicative of the quality of the butter when opened up in the warehouse of the London merchant. For example, if the flavour showed a trace of stale cream, the grader would be seriously at fault if he stamped the butter first class, as a product of this quality would quickly deteriorate after removal from cool storage. But to the average person this grade of butter would appear satisfactory, or it might be considered superfine. Again, a brand of butter might be absolutely free from any foreign flavour, and possess an agreeable taste, yet the carrying properties would not ensure a first-class stamp, as would be shown by the very inferior character of the texture. It is, therefore, evident that the grader's faculties must carry him further than the quality of the butter at the time of grading before he feels justified in affixing the official stamp. He must give careful consideration to all conditions which precede bad flavours, and also consider the age of the produce at the time of grading, the temperature at which it is to be stored previous to shipment, and the period of storage.

I have all along exercised this precaution in advising in the grading of Australian butter, as past experience has clearly demonstrated the dangers of classing produce entirely on the basis of its quality previous to shipment. It would be quite a different matter if our produce were manufactured for immediate consumption, but when it has to be exported a distance of 13,000 miles the above precautions are amply justified. It is the consumer in Great Britain who is the judge and the critic of Queensland butter, and it is he whom the manufacturer and the exporter have to please, and the efforts of the Department of Agriculture are made with a view to win the confidence and appreciation of the buyers and consumers at home and abroad.

MARKING BOXES.

This is a very sore point with some members of the industry, and a strong effort has been made to have the grade mark on the boxes abolished, for reasons which will be fully dealt with later on. From my observations here and in Great Britain, I fail to see that the principle upon which marking is based should be objected to by progressive dairymen and butter manufacturers, and what advantage the industry is to enjoy were the grade distinctions to be kept off the boxes. Experience has conclusively proved to me (as it has to others who have had similar opportunities to test the practice) that in ninety-five cases out of one hundred test boxes of Queensland butter graded first, second, or third have arrived in London in that class. Objections to marking the boxes may be expected from some factories where the classification of cream is scouted and brands of butter are made up of different grades; and I have good reason to point to this iniquitous management of the business of producers as one of the chief

causes for complaint. Stamping the boxes with the Commonwealth mark of quality, as the reader will quickly recognise, is a fitting reward for this condition of affairs, and, had the Government of Queensland lent its sympathy to the anti-grader in this direction, the dairy farmer of Queensland would not have been in so favourable a position as he occupies to-day. The protection marking gives to the dairying of the State is more thoroughly understood from the standpoint of the Queenslander who is fortunate enough to inspect the State's produce in oversea markets, and to follow it to the floor of the intermediate buyers and to the counter of the country grocer. Here I may narrate one instance which gives support to my contention.

While engaged in finding markets for the State's produce in Scotland and making inquiries into the demands of the trade, I traced a box of Queensland butter to the shop of a retail grocer in a fashionable town in the upper reaches of the Clyde. The box bore the official stamp of the State Government, and was classed No. 1. It also showed the grader's mark "Tested," which is a distinguishing mark put on every box sampled by the official inspector in Brisbane. Upon examination of the butter in the grocer's shop, I observed the mark of the grader's trier, and, after testing the quality of the produce, it was found true to the grade. The grocer did not hesitate to show his appreciation of the system of marking boxes, for reasons which I feel sure will find favour with every producer in Queensland. He explained, in terms similar to many others, that the country grocer had not found it convenient and profitable to go to the city to inspect his purchases of dairy produce, and, as butter went through a good many hands, there was the chance of getting an inferior product for which a high price might be quoted. With the Government grade distinction on the boxes he would only require to state in his order that it was butter marked first class, second, or third class he required, and on these boxes from Queensland the grocer would find the churning number and the date of manufacture of the butter, which would prove the age of the product, and be of great value in other ways.

"Tested."

In attacking the grade mark, no mention has yet been made to me that there is evidence that inferior butter improves *en route* to London, as shown by the examination of boxes of butter marked "Tested," which mark, as already stated, is put on every box the inspector examines when classing the grades. This step was taken by me to afford the trade in London an opportunity to determine who was responsible for any error which might be found in the classification of the butter by the factory or Department of Agriculture. The Department knows by the brands on the boxes who graded the butter, and when the necessary information is given of a faulty parcel inquiries are made through the proper channels to locate the mistake.

REGRADING.

Because butter is sometimes regraded previous to shipment, this is taken as an argument in favour of butter changing in flavour in cool storage to an extent that the grade marks become a menace to the disposal of the produce. In answering this contention, I may point out to readers that regrading is only done at the port of shipment when butter is of a quality that is termed a very poor first or second, as the case may be, and this applies to produce that has not been shipped at a period stated in the shipper's certificate, but has been returned to the cool store or retained there for export by another steamer—perhaps a tramp—sailing a fortnight hence to London by the South African route.

Regrading is not paying a compliment to the produce and the refrigeration of the chamber in which it is stored, for seldom is it found necessary to restamp

butter that has been kept at the proper temperature when delayed for shipment, and under the conditions necessary to prevent fermentation injuring its carrying properties.

WHY OBJECT TO GRADING?

When perusing these pages, the producer will probably ask himself the question,—Why resent the official inspection and classification of butter, when it has been conclusively proved in open competition that it has benefited the industry? But the dairy farmer will also learn in these pages of the existence of a strong desire on the part of the anti-grader to return to those years when everything was profit, and the manufacturer was master of the situation. One danger of grading lies in assisting the exporter to increase his profits, for a first-class butter might, through exposure to hurtful conditions after grading, change into a second-rate product; but a low-grade article will not cast off its stale and rancid flavour in the cool stores of oversea steamers, and afterwards grace the window of the British merchant, faultless in flavour. Herein may lie the crux to the position, for it is this sort of stuff that the exporter wishes to be left religiously alone; he fears not the choicest brands, and would willingly consent to every box being stamped with the Commonwealth mark of quality. Fortunately, I have had experience of this kind of butter and its attendant evils, and it is perhaps as well that the public are not conversant with the injustices which surround the butter business, although the Royal Butter Commission of Victoria did yeoman service to Australia in this investigation, for which we ought to be grateful. Speaking plainly, the object of recent agitations against butter grading is a breach of the spirit of the Dairy Act; and, with a knowledge of the past history of the butter industry in Australia to guide one, and which alone justified the introduction of the measure, any movement calculated to weaken or nullify any of the provisions of the Act would be nothing short of a calamity. One grand feature of the Act is to promote honesty in our commercial transactions, and confidence between buyer and seller. Concessions such as those requested by deputationists would lead to requests for still further concessions, and every point gained would be a step nearer those halcyon days when all butter, no matter how bad the quality, was described as "choicest this" or "primest that," in boxes containing from ½-lb. to 3 or 4 lb. less than the net weight stated on the brand. An old friend, "nominal weight," and similar devices to mislead buyers, which did such splendid service in the past, would once more appear on the commercial horizon. To my mind, the anti-grader has done estimable good for the cause of Queensland grading; in the first place, by falling helplessly into the traps he had laid for others; secondly, by the lack of knowledge he displays in all sections of the subject which concern the benefits the producer enjoys from the strict inspection of exports; and, lastly, by a vigorous protection of the demands of that type of keen and astute exporter whose whole ambition is wrapped up in the motto "Accumulated wealth." Let the cream supplier rest assured that his interests are being protected against the wrongdoings of the export trade, and I am determined that no stone shall be left unturned to win for his produce a reputation worthy of the industry and the State. My labours have been given particularly for his benefit, and I have no reason to be dissatisfied with the results achieved during the past four years.

INJUSTICE TO THE STATE.

The anti-grader has not been content to damage the efforts of the State to help the dairyman to make a success of his calling, but in his desire to crush grading has discredited the possibilities of Queensland to manufacture butter of a quality that would pass the rigid inspection of the Department of Agriculture to attain the coveted superfine grade mark. In the production of butter of this standard the factories have been successful, and thus the reputation of the industry has been deservedly advanced.

CO-OPERATION A REMEDY.

The co-operation of milk and cream suppliers to further the interests of the industry should be firmly established. When this is accomplished, and in the hands of strong leaders—men capable to guide the producer on the lines of true progress—many of the obstacles at present retarding the advance of dairying will be abolished.

[TO BE CONTINUED.]

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 31ST DECEMBER, 1907.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Whitefoot ...	Holstein-Sh'rth'rn	28 Sept., 1907	920	4·0	41·21	
Cocoa ...	Jersey	,,	872	4·2	41·01	
No. 1 ...	Shorthorn ...	26 Nov. ,,	947	3·4	36·06	
Reamie ...	Holstein-Sh'rth'rn	Oct. ,,	879	3·7	36·82	
Gurney ...	Grade-Ayrshire	,,	839	3·8	35·70	
Mona ...	Holstein-Sh-rth'rn	Oct. ,,	834	3·8	35·47	
Careless ...	Jersey	20 Oct. ,,	772	4·1	35·40	
Dripping ...	Holstein-Sh'rth'rn	28 Nov. ,,	750	3·9	32·76	
Haze ...	Ayrshire ...	,,	794	3·7	32·90	
College Lass	Ayrshire ...	14 Sept. ,,	795	3·6	32·05	
Dora ...	Shorthorn ...	9 Sept. ,,	768	3·7	31·82	
Laura ...	Ayrshire ...	25 May ,,	765	3·7	31·70	
Pee-wee ...	Holstein-Sh'rth'rn	6 April ,,	719	3·7	29·79	
Butter ...	Shorthorn ...	22 Aug. ,,	676	3·9	29·52	
No. 112 ...	Grade-Jersey ...	,,	691	3·7	28·63	
Gem ...	Shorthorn ...	28 Aug. ,,	704	3·6	28·38	
Princess ...	Shorthorn ..	,,	630	4·0	28·22	
Primrose ...	Ayrshire-Guernsey	May ,,	645	3·9	28·17	
Blackbird ...	Grade Holstein	Oct. ,,	687	3·6	27·69	
Honeycomb	Shorthorn ...	23 Aug. ,,	681	3·6	27·45	
Chocolate ...	,, ...	5 Mar. ,,	680	3·6	27·41	
Gin	,, ...	Nov. ,,	711	3·4	27·07	
Conceit ...	Ayrshire ...	28 Oct. ,,	669	3·6	26·97	

A JIMBOOMBA DAIRY.

Mr. R. S. Sigley, an inspector under the Meat and Dairy Produce Act, has forwarded us the following description of Mr. Christopher Thompson's dairy buildings at Jimboomba, Logan River, together with three views of the buildings and of a remarkable oak-tree on Mr. Thos. Thompson's dairy farm, near Logan Village, which affords a magnificent shade for the cattle. Our artist, however, states that, owing to the peculiar style of painting, the pictures are quite unsuitable for reproduction by any process, and would give no correct idea of the place. This is to be regretted, as we are always pleased to present to our readers views of farmers' and settlers' homes.

Mr. Sigley says:—

The dairy room consists of a double building; the outer walls are made of lattice-work; size of outside walls, 22 feet by 20 feet. Height of walls, 7 feet; and from wall plate to top of iron roof, 7 feet 6 inches. The room inside is used as a separator and dairy room; it measures 12 feet by 10 feet by 9 feet 6 inches in height, is built of dressed pine boards, and has one door and three sliding wooden shutters; there is also a piece of wire netting nailed in front of the windows, to prevent any animals from entering the room during the time the shutters are left open. The windows are 3 feet by 3 feet.

The cream room has a pine roof.

There are benches inside the dairy room or cream room for the purpose of standing dishes of cream on until the carter calls for it for transit to factory or railway station, when it is put into cans and thoroughly mixed before leaving.

The floors of the cream room and of the passage between it and the outer walls are laid with concrete, and are washed over every day.

Distance between the walls of lattice and the cream room is 5 feet, forming a passage. In this passage Mr. Thompson has a weighbridge, and weighs his cream before it leaves the dairy. He finds this very beneficial, and no trouble about weight has been caused since purchasing this machine.

There is also a tank alongside the dairy room, with a tap led into the passage, providing water for washing utensils, &c.

At the end of the dairy room there is a door leading into a race, 40 feet by 5 feet, and 7 feet high to the top of the iron roof. This race is floored, and kept perfectly clean.

At the end of the race is a shed 17 feet by 15 feet, containing 5 bails on each side, where the calves are fed.

All the calves receive an equal ration daily, according to age.

From the time of receiving the milk in the dairy room, the separating, calf-feeding, and washing of utensils is done without going out of cover. The distance from the dairy room to any building is 1 chain, and from the cow shed 3 chains.

The cow shed measures 46 feet by 18 feet, with a passage down the centre for feeding purposes, and there are 9 bails on each side of the race.

Mr. Thompson is busily engaged in building two receiving yards, 112 feet by 112 feet each, and of split material, three rails, and a cap. In one corner of one receiving yard there will be three stalls—one for a bull and two for horses.

His barn is 28 feet by 14 feet to the wall plates, and there are three stalls on one side, forming a lean-to, which are floored with wood blocks, and are very neatly put down; there is also another lean-to on the opposite side, where all vehicles are kept.

Mr. Thompson has purchased a young shorthorn bull by Perfection, which was bred by Messrs. McIntyre Bros., of Christmas Creek, *viâ* Beaudesert. Perfection was bred in the Illawarra district, New South Wales, and has secured prizes in that district as well as in Queensland. Mr. Thompson's dairy premises are far superior to any in this district where dairy work is done by hand labour.

A Large Swamp Oak-tree.

The tree mentioned above has grown since the 1887 flood, and has had no cultivation. I measured the width of the ground coverd by the limbs, and found the distance to be 68 feet in one direction, and 64 feet in another. The total height is 65 feet. The circumference of the trunk, about 2 feet from the ground, is 7 feet 5 inches; from the ground to lowest branches, 6 feet. I have never noticed a tree of the kind equal to this one in size and symmetry.

The Horse.

HORSE-BREEDING.

By P. R. GORDON.

Recent heavy shipments of horses to Indian and other foreign ports have revealed the fact that the horse stocks of Queensland have not been of such a radically inferior quality as was generally represented. It was, no doubt, the case that the class of horses shipped to South Africa during the war justified the severe criticism passed upon them by Imperial remount officers, but it has to be remembered that these had to be hurriedly selected, principally in the coastal districts, where, as is well known, the breeds had been allowed to degenerate, partly from the fact that the long-prevailing low prices did not justify expenditure in the introduction of fresh blood, but principally from the fact that on the coast watershed generally there is an absence of lime and other constituents necessary for bone-making, rendering it unsuited for horse-breeding without the aid of artificial feeding. Many of the shipments from these shores during the past four years, although far from first class, have been of a very useful description, principally collected in the Western districts; and, from the number of high-class sires that have been imported into the State from England, the other States, and New Zealand, since the breaking up of the drought in 1903, a much better class of horses will now come into the market. The description of stud horses introduced of late has been stout thoroughbreds, some fine specimens of the Suffolk Punch, a few good sires of the Clydesdale breed, and some remarkably good pony stallions. The establishment of mounted infantry regiments has created a very keen demand for ponies from 14·2 but not exceeding 15 hands, and even 13-hand ponies are valuable property in England and Ireland at the present time. The Exmoor breed of ponies is being largely drawn upon in the production of these. For some years buyers for India had loudly complained of the want of bone in our horse stocks, and they almost unanimously recommended the use of Suffolk sires to correct this fault; and a Select Committee of our Legislature recommended the same course. Several breeders responded by the importation from England and from popular studs in the Hunter district of New South Wales of some very superior sires of that breed. In a previous contribution to the columns of your Journal, I recommended the adoption of that course, not from any fancy for that type of cross, but to meet a strong prevailing demand on the part of foreign buyers; recognising the fact that, in horse-breeding as in wool-growing, the best-paying product has to be studied, even at the expense of sinking private opinion. It has not fallen to my lot to see many of the results of the Suffolk cross in this State; but, during a visit to the Northern Rivers of New South Wales two years ago, I had occasion to see several specimens of it, and had to admit that, however suitable it may be for collar work, the cross was certainly unattractive as saddle horses. I had the assurance of the owners, however, that the cross produced hardy slaves. This statement must be qualified by the fact that I had no opportunity of seeing the dams of the horses. The resort to any sudden cross, even as a matter of expediency to meet a passing demand, should be very carefully considered before adoption, bearing in mind that sudden crosses are apt to get beyond the control of the breeder. For superior saddle horses—in the absence of the Arab—there is no description equal to a stout English or Irish thoroughbred,

particularly the latter. Some superior stamps of horses of that description have during the past four years passed through Brisbane for the interior. It is difficult, however, to obtain such a horse. The purchase of a sire that has been successful on the turf is beyond the resources of a breeder of a bush stud. Many of the best qualities of the thoroughbred, notably that of endurance, have been sacrificed to mere speed, for which short light-weight races and the substitution of handicaps for weight-for-age races have been responsible. I have on several occasions pointed out that the principle of the handicap is to give the worst an equal chance with the best in a race. But, so long as gambling is permitted to be closely associated with the turf, there will be small chance of getting rid of this vicious principle. In alluding to the Arab, it should be understood that the reference was to the true Arab, not to the spurious article that has but too frequently been imported from India. There is a strong demand for what are here known as "gunners" and for heavy cavalry horses. It was for the production of these that the foreign buyers so strongly urged the use of the Suffolk blood. It is a debated question as to whether the Suffolk or the Clydesdale would be the best suited for giving the increased bone and weight. On this question I had the advantage of an interview with Warrant Officer Catchpole, who has probably had greater experience on that subject than any other man in Queensland. An artillery horse must have activity as well as weight, and Warrant Officer Catchpole's description of an ideal gun horse tallies precisely with what we could here produce by mating a well-bred hackney stallion with an active Clydesdale mare; while for heavy cavalry a typical animal, as described by him, would appear to be the product of a second thoroughbred cross on a Clydesdale or Suffolk mare. It appears that the hairy fetlocks of the Scottish horse would be no detriment, as trimming in the cavalry regiments is resorted to. But, after all, the percentage of heavy horses in demand is small compared with that for saddle and light harness purposes, and it will occur to breeders of long experience that, in the production of these, the use of either Suffolk or Clydesdale blood should be used with great caution, remembering that an alloy is easily introduced, but very difficult to breed out.

THE JACKSON POTATO-DIGGER.

We have, in a previous issue, described the new potato-digger patented by Mr. Jackson, agricultural implement maker, of Toowong. Our illustration shows the very simple light-running machine, which does the work most effectually. It does not grade the potatoes, but it takes them up so well that not a single potato can be found in the ground after it has passed over the field. Two horses are quite equal to working the machine during the day. We believe that Mr. Jackson has invented a machine which will reduce potato-digging to a pastime instead of a labour.

Plate V.

The Jackson Potato Digger.

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order GRAMINEÆ.

Tribe Bambuseæ.

ARUNDINARIA, Mich.

Spikelets 1-many-flowered, compressed, usually all bisexual, except sometimes the terminal, often sheathed; empty glumes 2, unequal, membranous; flowering glumes longer, obtuse acute, or mucronate, many-nerved; palea 2-keeled. Lodicules 3-ciliate. Stamens 3, rarely up to 6. Ovary globose above; style short, stigmas 2-3-plumose. Grain ovoid or narrowly-oblong, dorsally furrowed, included in the glume and palea. Erect or climbing shrubs. Stems slender, nodes usually prominent, internodes rather short, branches short fascicled. Stem sheaths papery, straw-coloured, blades subulate. Leaves usually small, jointed on the sheath. Inflorescence on separate stems or terminal, or on leafing branches. Species, about 50: 14 in America, 1 in Africa, the rest being Asiatic.—Gamble, in Hook. Fl. Brit. Ind. VII. 376.

? **A. Coboni,** *Bail.* Stems caespitose, erect, 26 or more ft. high, diameter 1½ in. or probably more, nodes but slightly enlarged, internodes 1 to 2 ft. long, walls thin, about 2-ninths of the stem diameter; branchlets fasciculate at the nodes. Leaves from 12 to 15 in. long, 2 to 2½ in. broad, texture thin, lanceolate-oblong, base undulate, scarcely petiolate, midrib smooth, light-coloured longitudinal nerves about 12 on either side of midrib, very slender, and closely tessellated by horizontal veinlets, also dotted with numerous pellucid glands, margins slightly rough. Ligula composed of a row of stiff-bristles 3 or 4 lines long; sheaths keeled; bristly at the top, otherwise nearly glabrous.

This present bamboo differs considerably from the tall climbing one of the Russell River scrubs, but, as the inflorescence of both so far are unknown, their respective positions cannot as yet be definitely assigned. The distinction is shown especially in their habit and structure—the one having upright, the other climbing stems, with in one thick the other thin walls.

This plant is found on rich land adjacent to running water, at an elevation of about 500 ft. The aborigines do a small trade in exchange for black-palm spears.—J. J. C.

Hab.: Head of the Starcke River, *James J. Cobon.*

Horticulture

FLOWER GARDENING.

BY THE EDITOR.

INTRODUCTION.

Most people are fond of flowers, and can admire a pretty garden; but, in many cases, they have not the elementary knowledge necessary to enable them to successfully form a flower garden which shall be in bloom throughout the year. It needs only a glance at the Brisbane Botanical Garden, so excellently managed by the present Director, Mr. J. F. Bailey, and the beautiful, ever-blooming garden at the Executive Buildings, so well cared for by Mr. R. Soutter; or, again, the artistically laid out and tastefully arranged Botanical Gardens at Toowoomba, under Mr. Harding's fostering care, to see what can be done in the way of beautifying the surroundings of the suburban or country home. To assist would-be horticulturists, I have compiled the following information and instruction in flower gardening from the best authorities on the subject, professional and amateur, and also from their latest papers, lectures, and pamphlets on the various flowering plants, shrubs, and trees suitable to the Queensland climate generally. This has involved the comparison of many of these authorities, and, as a result, I have tried to render the work as practical as possible, leaving out as much as could be reasonably eliminated of scientific and professional terms, so as to make it easily intelligible to those for whose guidance it is intended.

HORTICULTURE.

In our sunny Queensland, where all the flowers of tropical, sub-tropical, and temperate climates can be grown out of doors, few people realise to what perfection the extensive cultivation of flowers has been brought in some countries which would scorn to be debarred by their climate from such an enjoyment. No doubt, in years to come, when civilisation is more advanced, and there will be more leisure than is usually available to the pioneer in a new land, an ennobling taste for flowers will also develop in our midst, and, in addition to the simple delight of beautifying the home, a lucrative trade in cut flowers and pot plants will arise. Meanwhile, let everyone blessed with the possession of a home make it homely and attractive by surrounding it with a few of the less exacting flowers. Our opportunities in that direction are, perhaps, unique in the world. Then let us rise up and be equal to them. A few small beds of flowers around the family home are a constant source of pleasure, enjoyment, instruction, recreation, and in years to come, when we are wandering through the world, of the most pleasant recollections connected with our childhood.

When we look round the suburbs of Brisbane and compare the tasteful adornment of some of the country residences of city workers with others adjoining them, where no attempt has been made to beautify even the piece of land in front of the house, we cannot fail to be surprised at the neglect of so charming a relaxation after a day's work in the hot city offices and shops as gardening affords.

Horticulture is a most delightful hobby, and may, by its absorbing interest, become something more than a pastime. He who would lay out for himself a rural paradise here below, cannot do so more successfully than by planting trees and flowers. But how do many people set about this work?

Some plant trees merely to shut out their neighbours. There is another class who set apart a small plot of ground near the dwelling, and lay it out with a dash of so-called architectural skill, mostly of a varied and severe type, the beds diversified in form and size like a collection of animals in a zoo. Into these beds are jammed as many plants as the superficial area will accommodate, no allowance being made for future development. Could anything be more out of tune with Nature?

But even this is better than the usual condition of the back yard, where the picture usually presented to the public gaze is:—A washing boiler standing sad and lonely on three bricks, half buried in a healthy patch of *Sida retusa.* A few kerosene tins in various stages of decay; numerous variegated jam tins, intermixed with unchoppable blocks of wood from the wood heap. A few tired looking clothes props; a consumptive-looking peach-tree that does duty as a hen roost or supports a clothes line; and a rickety tumble-down fowlhouse.

And this is a common picture to be seen in almost every part of the State, the exceptions, as a rule, being the grounds surrounding the tenement of a German resident.

How to alter the picture is the next question. The first thing asked by those who have determined to make a garden is: "What will it cost?" That is a very natural and important question. To make a garden properly, you must take an active hand in the work yourself, remembering always that with ordinary common-sense any kind of soil can be converted into a garden for the production of flowers and vegetables.

The great secret in successful horticulture is a perfect knowledge of the seasons, so as to adapt each variety of cultivated flowers to the needful temperature and rainfall. Seasonable sowing, transplanting, and pruning, and seasonable working are the elements of success.

Laying out the Garden.

There are two ways of laying out a flower garden, and these are the "formal" and the so-called "landscape" or "natural" style. I will at once discard the formal garden as being quite unsuited to horticulturists, whether amateur or professional. In a garden, which is man's work, man's hand should be visible, showing some object in view. The garden should be designed with some apparent relation to the external shape of the house, and the beds so arranged that only portions of the garden can be seen at once from different points.

If the grounds available for the formation of a garden will lend themselves to the creation of a grass lawn in front of the house, so much the better, for nothing sets off a garden so well as a well-kept lawn, laid down with couch grass. If space will permit, the lawn should be circular, with a gravel path running round it, but if not the gravel path should lead from the front gate to the house. A flower border right round the house, or at least in front, should never be omitted. After the lawn has been marked out, flower beds corresponding to its shape may be cut out. But, before anything is done in this way, the soil must be thoroughly broken up, trenched, drained, manured, and levelled. It will then be ready to be laid out in beds.

The laying-out of the beds is a matter depending on the good taste and very often on the eccentricity of the gardener. Some prefer a rigidly geometrical appearance, like the formal Dutch garden. Others delight in irregular, scattered beds, traversed by winding grass or gravel paths, bounded by privet or Duranta hedges, with here and there light bamboo trellises and kiosks supporting flowering climbing plants. With the addition of a few shade trees, such as jacarandas, poinsianas, albizzias, magnolias, &c., such a garden, well cared for, is always a never-ending source of pleasure and enjoyable employment for the owner. Wherever a plentiful supply of water is available, a small pond and one or two fountains will lend additional beauty to the natural garden.

There are many beautiful aquatic plants which will thrive in the pond, and others which can be grown to best advantage around its edge in the soil. In this climate, a bush-house is almost indispensable for shade-loving plants, such as orchids, many varieties of ferns, caladiums, primulas, gloxinias, calceolarias, cinerarias, &c. Rockeries again afford ample scope for further beautifying the garden.

HEDGES.

A well-trimmed hedge round a garden is always more pleasing to the eye than a paling or wire fence, and, with ordinary care and forethought, there is no difficulty in quickly producing a handsome and, at the same time, an impervious hedge. In ordinary good garden soil, it will suffice to dig a trench about 2 feet wide and from 12 to 15 inches deep along the fence, breaking up the soil well before returning it to the trench. Of the several kinds of plants suitable for hedges, the two best for the climate of Queensland are the privet and the *Duranta plumieri*, both blue and white. The latter makes the most rapid growth. It strikes freely from cuttings, is seldom touched by wandering stock, and forms a dense growth. In less than three years after rooted plants are put in, it will make a good hedge 4 to 5 feet high. If rooted plants are used, plant them about 15 inches apart, and cut down to about 6 inches. Cuttings should be placed at about half the distance apart (6 to 8 inches). These latter should be 12 inches long, and only two buds should be above the ground. See that the soil is pressed close to the base of the cutting. The operation should be performed in damp weather. Failing this, attention must be paid to watering until they have taken hold of the ground.

Evergreen hedges, such as the above, should be regularly pruned, preferably in the spring, and kept to a breadth of about 18 inches.

LAWNS.

The land having been prepared as above directed, the next thing to do will be the formation of the lawn. The ground must be well ploughed during the summer, if possible, and allowed to lie for a short time exposed to the action of the sun, wind, and rain before being harrowed down. The hand-dug lawn must, of course, be treated in the same way. The more the soil is worked, whether ploughed or dug, harrowed or raked, the better it will be for the future grass, since the more plant food is thus rendered available. All the grass, weeds, and other rubbish gathered by the harrow or rake must be burned either on the ground or close to it, and the ashes scattered over the surface of the worked ground. Now the latter has to be reduced to as fine a tilth as possible to enable it to slightly cover such small seeds as grass seeds. The necessity for draining the ground has already been pointed out. In order to give body to the soil for the establishment and future maintenance of the grass, bonedust should be sown before the seed at the rate of about 5 lb. per square perch. When sowing grass seed, it is well to mix it with fine ashes, by which means the small seed is more evenly distributed than if it were sown alone. To make a good lawn, thick sowing is imperative—1 lb. per square perch is quite little enough to produce a close, springy turf. As soon as the lawn is sown, harrow the seed in with a light brush harrow, which is preferable to using the rake. Then roll the ground with a heavy roller, to give firmness to the soil, and to prevent evaporation in dry weather and the scorching up of the young plants before they have become firmly rooted. During such weather, water frequently, both before and after the plants are up.

As soon as the grass is high enough to catch the scythe it must be closely mown, then rolled, and the process continued every week, because it ensures a close bottom being obtained.

TOP-DRESSING.

Whether the soil be rich or poor, the lawn will always benefit by an occasional top-dressing with bonedust, wood ashes, or other fertilisers. A good liquid top-dressing consists of fine mould, mixed with 1 oz. of nitrate of soda,

1 oz. of potash sulphate, dissolved in 4 gallons of water. Give a good watering with this solution immediately after top-dressing with solid fertilisers. Never use any chemical to destroy weeds on the lawn. They should be taken out by the roots by hand.

An Effective Roller.

As already stated, a lawn requires a good deal of rolling, and a roller is a rather expensive garden appliance. But a very cheap, and at the same time a very effective, roller has been constructed by a gentleman at Beaudesert. He sent the following description of it to a local newspaper:—

To those who do not wish to invest in the expensive article, the following description of one made by the writer may be, perhaps, useful. It has now been in use about twelve months, and up to the present has worked admirably. The cost of same amounts to no more than about 15s.; in fact, where sand and screenings for the cement part are handy, it can be made for less. The following instructions as to how to proceed may be clear to most:—

Get a galvanised-iron cylinder made by your plumber out of not less than 22-gauge iron, about 24 inches long and 15 inches in diameter, with the seam of same made on the inside; into each end fit two wooden circles out of 1-inch thick timber, exactly the same diameter—viz., 15 inches. Perhaps a shade more would be better, so as to make them fit tighter. In the centre of each of these wooden ends bore, say, a ¾-inch hole, to take an iron bar (round), to act as the axle of the roller. Then get, say, half a barrow load of fine quarry screenings, the same quantity of clean white sand, and about 2 buckets of Portland cement, the proportions used to make a good solid binder being 1 part of cement to 2 parts of sand and screenings mixed. Of course, charges can be made stronger as desired. Perhaps it would be as well to get a bricklayer's advice as to the proportions in making the cement part. To fill your cylinder, insert one of the wooden ends into same, allowing it to stand flush with the outside edge; then stand on its end, inserting the bar of round iron (axle) in the hole already bored, allowing it to project about 2 inches through, to allow for a handle to be fastened on. Then get ready the cement, turning the mixture over well, and using it fairly wet, so as to fill up all crevices; fill up cylinder as quickly as possible, ramming the mixture well down. See that you have sufficient to fill the cylinder at one charge. Fill up to within an inch of the top; then put on the other wooden end, and allow the roller to stand until the cement is thoroughly set. For the handle, the same shape as that of an ordinary lawn mower, on a large scale, acts very well. Fit same on, and the roller is ready for use.

Laying out the Beds.

Whatever may be the style of the beds, they should be symmetrical; they should not be too large, and sufficient space, whether of turf or gravel, should be left between them. The figures should be simple and without acute angles, complex figures are especially to be avoided, as they are difficult to plant effectively, difficult to keep neat and clean, and hence cause an increase of labour, with corresponding extra expense. The best way to lay out the beds is to first make a plan on paper, and then transfer it to the ground, the paper plan having been drawn to scale.

Having this plan to go by, the gardener will have no difficulty in laying out the beds symmetrically, as the garden line will enable him to strike circles on the ground as correctly as the compasses will on the paper.

Before a figure is begun, the ground must be trenched, levelled, raked, and rolled hard and smooth; a pointed stick will then make all the mark that is required, and a number of pegs to place in the portion of the figure that is to be preserved will suffice for the rest.

The walks should be laid out and formed with a rise of 2 inches at the centre, to prevent the lodgment of water. The surface gravel need not be deeper than 3 inches, as it is best to add a little annually, so as to maintain a

fresh appearance. Walks seldom require a foundation of metal, unless the soil be soft or moist, as is the case on the rich red and black soil of the Darling Downs and on the scrub lands generally.

ARRANGEMENTS OF PLANTS.

Plants may be arranged in either of two different modes—one in which each plant stands singly; the other in which a number of plants of the same species are arranged in a group. The adoption of either of these styles depends upon the size of the garden. Where the area of land is small, the single-plant or "dot" system must be chosen, otherwise there might not be room for the number of sorts it is desired to plant. But where the area of ground is larger, then the grouping system should be followed, in order that the same species or variety may not have to be duplicated.

The grouping style consists in planting a given number of plants of each species in a mass, of a size proportionate to the extent of ground, allowing each plant just as much space as, when grown up, will cause the group to appear as a whole, without being overcrowded. The strict rule of having only one group of each kind may, in certain cases, be departed from, as when it is desired to brighten parts of the plot by lilies or other gay flowering plants. The plants should be arranged according to height and colour, the dwarfest in the front and the tallest at the back, for, though a slope perfectly level on the surface is not desirable, plants vary in height and bulk from one year to another to such an extent that there is little danger of perfect uniformity being produced. Of course, the groups should be irregular in form and size. The arrangement of colour is, however, of extreme importance, for, unless it is carried out in a scientific manner, the collection would fail in attractiveness. There should be no violent or jarring contrasts, and the season of flowering of each kind must be taken into account, so that there may be an equal proportion of flowers throughout the plot at all seasons.

WATERING PLANTS.

Of all the processes in gardening, watering is the one that is most frequently ill-performed. It is customary with amateur gardeners to wash the dust off garden plants by watering overhead. The idea is to clean the leaves, open the pores, and so give the poor plants a new lease of life. But this overhead watering is a great mistake. A too common method is to water little and often, by which the soil is hardened and the roots brought so near the surface that, in the event of the soil becoming dry, they are likely to perish. Many do not commence to water sufficiently early in the season until the plants show that they are suffering from the want of it, whereas watering should be commenced as soon as the soil begins to change from wet to dry, so as to keep up a full supply of moisture and enable the plants to take advantage of the high temperature, which they cannot do unless fully supplied with liquid food. When the flowers are out, care should be taken that too much water does not get on them, or they will be bleached by the sun, especially if watering is done in the morning. At any time water on the flowers is not good. The best time to water is in the evening. Give the plants water at the roots—as much as they will take up—and the tops will look after themselves. In order that the water may pass freely downwards, the soil should be loosened with a fork to as great a depth as can be done without coming in contact with the roots. The more water you give plants, the more they require. This is especially the case with the annuals. Take two of the same kind, stand one in water and just keep the soil of the other moist; the one in the water will flag more in the sun than the other.

MULCHING.

Watering should be followed or preceded by mulching, which has a most beneficial effect in retaining moisture in the soil. Mulching checks the fierceness of the sun's rays during the hot months, thereby keeping the surface cool,

retarding the evaporation of moisture, and protecting the surface roots. The operation of mulching consists in spreading on the surface of the soil around plants, shrubs, or trees (so as to entirely cover the roots) any light material that will sufficiently shade the ground without preventing the passage of rain into the soil. Various materials may be used as a mulch, such as rotting straw, decayed leaves and weeds, leaf mould, fine top soil, spent tan, and well-decayed manure. As neatness is requisite in a flower garden, the four latter materials will be found the best to use.

BUSH-HOUSES, FERNERY, AND ROCKERIES.

THE BUSH-HOUSE.

Not every amateur can afford to erect a greenhouse, yet, as there are many delicate plants which will perish or only drag out a miserable existence if planted in the open, some form of enclosed shelter for them is an absolute necessity. This may be easily provided by the erection of a bush-house, the materials for which are to be obtained, if not on the land itself, at least at no great distance in the neighbouring forests and scrubs. A bush-house should be proportioned, as to size, to the size of the garden. A convenient size is 20 feet long by 12 feet wide, and it will be found that a very large number of plants can be raised within this space. The timber requisite for the structure consists of a few strong, rough posts, wall-plates, and rafters, all of round bush timber. The height from the ground to the eaves may be from 8 to 10 feet. The roof may be flat instead of gabled, and the flat roof is generally more convenient than the latter. It must be remembered that the object of a bush-house is not to totally exclude the light, but merely to break up the sun's rays, and so to produce a diffused light instead of a fierce glare. This object is achieved by covering the roof with light brushwood, such as light branches of ti-tree or swamp oak. The covering should not be too thick, but just thick enough to, as I said, break the direct rays of the sun. The bushes are held in place by binding them down with wire to the rafters. The sides of the building require somewhat more shelter, especially on the side facing the prevailing wind. In this State, the westerly winds must be particularly guarded against. To protect the plants, then, whilst at the same time affording them sufficient air and light, the sides may be built up to the height with upright logs—to a height, say, of 4 feet—and the space above may be filled in with ti-tree held in place with wire stretched between the posts. A raised bed should be constructed along the two sides and end of the bush-house, and the centre may be occupied by a rockery for the reception of ferns, fern-trees, palms, &c. Baskets of wood or wire, hung from the rafters and tie-beams, containing graceful drooping plants of kinds which I will deal with later on, add great beauty to the bush-house.

FERNERY.

Without going beyond the limits of Queensland, a great variety of very beautiful ferns may be obtained without much difficulty, and with ordinary care most of these may be grown in the open. Nearly all ferns are shade-loving, and they can be grown to a high degree of perfection in the ordinary bush-house, where they may be either grown on the open beds or in pots. If the bush-house is sufficiently large, a rockery may be formed in it, with pools, small jets, and little streams of water. The soil should be of good quality, scrub soil for preference; but, if this be unobtainable, it should be enriched with vegetable mould or much-decayed cow dung in imitation of the natural vegetable soil of the glens or gullies in which ferns naturally luxuriate, whilst a compost, including peat soil, must be provided for those of delicate constitution. The stronger species require rich feeding, and, as soon as they are thoroughly established, should be occasionally watered with liquid manure. The soil should not be allowed to become dry; therefore, during the season of growth, heavy waterings should be given once or twice a week according to the

weather. The plants should be syringed daily or twice a day, morning and evening, during hot winds. They should be frequently examined, lest thrips or scale obtain a lodgment, which, if detected, should be immediately despatched—the thrips by means of strong soapsuds or tobacco water, the scale by sponging or syringing with a solution of kerosene and soft soap.

The fernery need not be confined to ferns alone, but may have an admixture of grasses, sedges, Phornium, and shade-loving shrubs, such as Griselinia and Coprosma.

Nearly all the dwarfer kinds and some others might be planted in the raised beds or in rustic pockets attached to the walls, while those of drooping habit could be hung up in baskets; then, if water is present in the shape of a fountain, Hymenophyllums and similar sorts could be placed within reach of the spray.

ROCKERY.

Now, as to the rockery. The best situation for a rockery is in some secluded place in the garden, where it is partially concealed. In forming a rockery, a good body of suitable soil should first be laid down, and shaped according to design; then the stones, or coral blocks, which should be of various sizes, bedded into it at varying depths, odd ones and groups of threes being placed outside the general design, especially at the base of the more prominent portions, some laid flat on the ground, others more or less buried. It should be always borne in mind that the primary object of a rockery is the growth of plants, and not the mere display of a heap of stones. The plants selected for growing on a rockery should include a large proportion of drooping, trailing, creeping, and climbing species; for the latter, a few forked stems of trees might be fixed at intervals.

Having now shortly set down the preliminary steps to be taken in the formation of a flower garden, the next thing is to describe the treatment and cultivation of different varieties of flowering plants, and to point out those which are more particularly adapted for out-of-door culture, for the bush-house, the fernery, the rockery, and the water. The subject of orchids will be dealt with in a separate chapter.

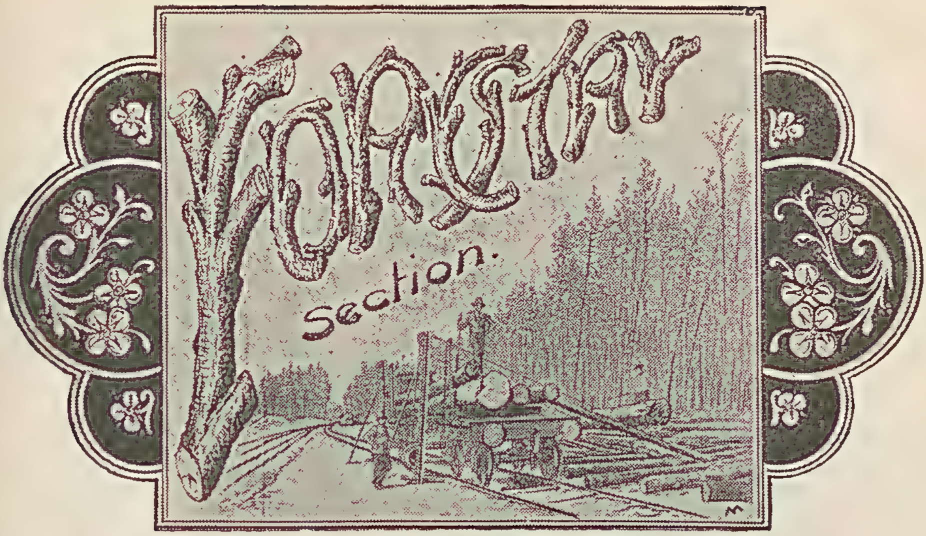
[TO BE CONTINUED.]

THE STRENGTH OF DIPS—UNRELIABILITY OF THE HYDROMETER.

Notwithstanding that the Department of Agriculture and Stock, so far back as 1904, instructed the stock inspectors that no mechanical means of testing dip fluids by the aid of the hydrometer or by spindles was to be relied upon, and that the only reliable test was by chemical analysis, some stockowners have, although warned by the inspectors, persisted in the use of the hydrometer, large numbers of which have been sold to dairy farmers. A case occurred during December last year, where a dairy farmer at Kholo dipped his calves in Royal Dip, the strength of which, as shown by the hydrometer, was three points below full strength. The result was that, up to the 14th December, nine calves had died, and a number of others were sick.

It is as well that stockowners should know that the so-called testers are unreliable.

In this case, the dip fluid has been analysed by the Agricultural Chemist, Mr. Brünnich, and was found to be of nearly double strength (An. 482). Mr. Brünnich recommended that the use of the hydrometer be stopped, as the test is quite useless and misleading. Many cattle have been killed by being dipped in fluids tested with the aid of hydrometers only, and the Department again desires to impress this fact on stockowners: *Chemical analysis alone will give a reliable test of the strength of dip fluids.* The stock inspectors have all been requested to caution stockowners to the above effect.



THE CRICKET-BAT WILLOW.

There is no country on the face of the earth better adapted for the growth of the willow than Queensland. On the Darling Downs, at Toowoomba, Clifton, Dalby, Warwick, and a host of other districts, the willow thrives to perfection. The willow and cricket are intimately associated, and cricket may be called the premier national game of Australia. But without the willow cricket would languish, and that there is danger of this result owing to the scarcity of the true cricket-bat willow will be apparent from an article on the subject which we take from the Journal of the Board of Agriculture, London. It would seem from this article that there is an excellent opportunity to establish a paying industry in willow timber, and we have no doubt that the attention of Mr. Mac Mahon, Director of Forests, will be given seriously to this branch of forestry.

Our illustrations are taken from the Kew Bulletin, No. 8, 1907.

The article referred to reads as follows :—

In recent years the supplies of willow adapted for the manufacture of cricket bats have become serious limited, and prices have risen in proportion. At a sale of willow trees on Sir Walter Gilbey's estate at Sawbridgeworth, in February, 1906, the best "bat willow" realised prices estimated to be equivalent to about 7s. per cubic foot. The agent of a large estate in Essex is said to have declined an offer of £1,500 for the best 100 willows on the estate; and Mr. John Shaw, of the well-known firm of Shaw and Shrewsbury, of Nottingham, last winter offered £40 for a single tree. When it is remembered that trees have been known in favourable situations to reach a saleable size in twelve years (having in that period attained a girth of about 50 inches), these prices show that there is no timber so profitable at the present time as that of the cricket-bat willow. It is not surprising, therefore, that the attention of owners of land suitable for the growth of willows should have been attracted by this tree. As a matter of fact, a large number of willows have been planted during the last few years with a view to meeting the future demand. But we have it on the authority of Mr. Shaw, one of the largest buyers as well as a leading expert, that not more than one-fourth of the trees that are being planted are the best cricket-bat willow.

The identity of the true "bat willow" has always been obscure. The cricket bat-maker recognises the tree best suited to his purpose with infallible certainty, but the characters on which he relies are not characters on which the botanist

bases his distinctions. With a view to helping the planter to recognise the willow best suited for cricket bats, the matter has been investigated at the Royal Gardens, Kew, by Mr. W. J. Been, and the information available is published in the Kew Bulletin, No. 8, 1907.

The "Open-Bark" Willow (*Salix fragilis*, L.).—The two commonest terms used in describing willows from the bat-maker's standpoint are "open bark" and "close bark." There is no difficulty or mystery about the "open bark." It is the Crack Willow—the *Salix fragilis* of Linnaeus—a common tree on the banks of the Thames near Kew. Although a useful timber in other respects, it is of very inferior merit for the making of cricket bats. It is, in fact, used only for the manufacture of cheap bats for children.

The Best "Close-Bark" Willow (*Salix alba*, L., var. *caerulea*, Syme [*S. caerulea*, Smith]).—The willow selected by Mr. Shaw as the very best one for bat-making is a tree of markedly pyramidal habit; it is female, or seed-bearing; and it belongs to the bluish-leaved variety of the white willow. It is, therefore, a pyramidal form of *Salix alba*, var. *caerulea*. The bark is less rough than in *S. fragilis*, and the corrugations are less prominent, straighter, and more continuous up and down the trunk of the tree. The wood is white, and when it is being split does not part so easily as the "open bark" does, but splinters a good deal. This splintering, or tearing, down the cleft is regarded as an evidence of good quality.

According to Mr. Shaw, tree of this type are only to be found, at the present time, in the counties of Essex, Hertford, and Suffolk. A few trees were at one time growing in Kent and Surrey, but it is his belief that the true "bat willow" is no longer to be obtained there. Neither Cambridgeshire nor Lincolnshire has it, nor does it exist (except for recent plantings) north of the Trent. This all goes to show that this willow is a local form, and that only those "sets" can be relied on which have been obtained from the right district. *Salix alba*, var. *caerulea* is grown at Kew, where there are two fine specimens on the banks of the lake. But, although in character of leaf and fruit they are identical with the typical trees selected by Mr. Shaw on the Copped Hall Estate, in habit they are quite different. The trunks have forked low, and the habit is more spreading. Although some of the Copped Hall trees are growing in hedgerows, and have ample room for lateral development, their tapering pyramidal form is a most noticeable characteristic. This is associated with, and may in some measure be due to, a great vigour of growth.

In regard to quality of timber for cricket bats, the typical *S. alba* appears to be intermediate between *S. alba*, var. *caerulea*, and *S. viridis* (see below). Botanically, there is no well-marked dividing line between *S. alba* and *S. alba*, var. *caerulea*, the two being united by intermediate forms. It is possible that the quality of timber improves as the tree approaches the latter.

Salix viridis, Fries.—There is another willow recognised by Mr. Shaw as a "close bark" and of a useful quality, but still inferior to that of *Salix alba*, var. *caerulea*. Although it is not easy to put on paper the differences between the "open" bark of *S. fragilis* and the "close" bark of the true "bat willow" in such a way that they can be indubitably recognised, they are appreciated easily enough when seen in the field. But the differences between the two "close" barks are by no means obvious to the uninitiated, though the trees are distinct enough in other respects. The habit of this second tree is more spreading than of *S. alba*, var. *caerulea*; the leaf is smaller and not so blue; and the trees are presumably male. This tree is considered to be *Salix viridis*, Fries.

Salix viridis is a hybrid between *S. alba* and *S. fragilis*, and as these species frequently grow together they have no doubt crossbred very many times. It is quite probable also that the progeny have interbred with the parent species again. At any rate, *Salix viridis* is a very variable tree, showing numerous intermediate gradations between the two parents—sometimes approaching *S. alba*, and *S. alba*, var. *caerulea*, so closely in leaf as to

Plate VII.

The "Open-Bark" Willow.

Salix fragilis, L.

Plate VIII.

The Best "Close-Bark" Willow.

Salix alba, L., var. *caerulea*, Syme.

be indistinguishable from them, and sometimes showing very distinctly the influence of *S. fragilis.* Its advent into the cricket-bat willow question has created a good deal of confusion. A specimen approaching *S. alba*, var. *caerulea*, may be described as good by the bat-making expert, whereas another approaching *S. fragilis* will be accounted inferior. Yet to the botanist both are *S. viridis.*

From the bat-maker's point of view the timber of *Salix viridis* is not so good as that of *S. alba*, var. *caerulea*, because the wood is coarser and heavier. A bat made of good *S. viridis* timber would weigh about 2 lb. 7 oz. to the 2 lb. 4 oz. of *S. alba*, var. *caerulea.* The difference in market value is also so considerable as to be important to intending planters. Mr. Shaw stated that, for trees of equal size, buyers would give £10 for the *S. alba*, var. *caerulea*, but only £6 for the *S. viridis.*

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Salix Russelliana, Smith.—In connection with the "bat willow" question the name of *Salix Russelliana* frequently crops up, and is a source of considerable confusion. A correspondent of Kew complains that, whilst one person tells him that *Salix Russelliana* is an excellent willow for bat-making, another says that it is quite worthless. The probable explanation of this is that "Russelliana" is a name that has been given to two different willows. Most commonly it has been applied to the "crack willow" (*S. fragilis*); in that connection, therefore, it indicates the very inferior willow for bat-making. But the name has also been given to the hybrid between *Salix alba* and *S. fragilis*, which, as has already been explained, is itself a variable plant, but is often of good, although not the best, quality. The name "Russelliana" is now no longer used by the leading authorities on British willows, so that those interested in the cricket-bat willows would do well to discontinue its use.

Popular and Local Names.—Another source of confusion arises from the use of local names. So misleading are they that they should be dispensed with altogether in connection with the present question, since it is hopeless now to find one popular name restricted to one particular willow. A name given to a particular species or variety may be in general use in one district, but it may be given to quite a different tree in another. The term "Huntingdon willow" and "Leicestershire willow" have both been applied to *Salix alba*, to *Salix alba*, var. *caerulea*, and to *Salix fragilis.*

Propagation and Cultivation.—It will have been gathered from what has been said that there is at the present time a brisk demand for young trees or "sets" of the true "bat willow." Inquiries are being continually addressed to Kew as to where they can be obtained, but no one is known at the present time who is able and willing to supply them in quantity. It is of little use applying to the ordinary trade firms. With the best will and the most honest intentions they may supply the wrong tree, because, as has already been pointed out, it is not *Salix alba*, var. *caerulea*, merely that is wanted.

So far as our present knowledge takes us, it is the erect-growing form alone that can be relied on, and then possibly the female plant only, and it is only safe to plant stock which has come originally from the countries of Essex, Suffolk, or Herts.

The usual method of propagating this willow is by means of "sets." These "sets" are branches cut as thick as, or thicker than, a broom-handle, with the minor branches and twigs removed; they are thus transformed into bare rods which, when planted, are 8 to 10 ft. or even more in length. "Sets" of about

this length are preferred, so that the young growths may be out of reach of cattle, &c., and the young trees away from the various dangers that beset them when they are near the ground. They are also suitable for thrusting in hedge-rows and such like situations. Care should be taken to prevent cattle from injuring the stems. In some places willows are being pollarded for the especial purpose of producing "sets" of the desired size.

The willow is one of the most easily propagated of all trees, for every twig will grow, and the use of cuttings made of shoots as thick as a goose-quill and, say, 1 ft. long, is recommended. Cuttings of this character, planted in the Arboretum Nursery, at Kew, in the spring, were 6 feet high in August. For thicker wood the cuttings may be proportionately longer. These can be put in the ground in autumn or early spring. As they grow it would be necessary to keep them each to a single leader and to prune back the side branches and remove the lower ones as the plants grow in height. In well-kept nursery ground fine healthy plants could be produced in two or three seasons, and they could be grown to planting-out size at the rate of 8,000 or more to the acre.

Whilst these willows like abundant moisture, a position by the side of water is not necessary. Fine specimens are grown in deep, rather heavy clay, with only an ordinary hedge-row ditch on one side, and timber grown in such a position is preferred to that of trees growing close to the edge of ponds, &c.

Young trees should be watched to see that they are kept to a single leading shoot. This will obviate the forking of the trunk low down, which, of course, detracts from the value of the tree by reducing the amount of good timber. Trees, however, are more liable to fork when growing in isolated positions than they are when close together in plantations.

The article in the "Kew Bulletin" is illustrated and contains a botanical description of the willows considered.

Times of Sunrise and Sunset at Brisbane, 1908.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·56	6·45	5·20	6·42	5·41	6·20	5·57	5·46
2	4·57	6·46	5·21	6·42	5·41	6·19	5·58	5·45
3	4·58	6·46	5·22	6·41	5·42	6·18	5·58	5·44
4	4·58	6·46	5·23	6·41	5·43	6·17	5·59	5·43
5	4·59	6·46	5·23	6·40	5·43	6·16	6·0	5·41
6	5·0	6·47	5·24	6·40	5·44	6·15	6·0	5·40
7	5·0	6·47	5·25	6·39	5·44	6·14	6·1	5·39
8	5·1	6·47	5·26	6·38	5·45	6·13	6·1	5·38
9	5·2	6·47	5·26	6·38	5·45	6·11	6·2	5·37
10	5·2	6·47	5·27	6·37	5·46	6 10	6·2	5·36
11	5 3	6·47	5·28	6·36	5·46	6·9	6·3	5·35
12	5·4	6·47	5·29	6·36	5·47	6·8	6·3	5·34
13	5·5	6·47	5·29	6·35	5·47	6·7	6·4	5·33
14	5·6	6·47	5·30	6·34	5·48	6·6	6·4	5·32
15	5·6	6·47	5·31	6·33	5·49	6·5	6·5	5·31
16	5·7	6·47	5·31	6·33	5·49	6·4	6·5	5·30
17	5·8	6·47	5·32	6·32	5·50	6·3	6·6	5·29
18	5·9	6·47	5·33	6·31	5·50	6·2	6·6	5·28
19	5·10	6·47	5·34	6·30	5·51	6·1	6·7	5·27
20	5·10	6·47	5·34	6·29	5·52	5·59	6·7	5·26
21	5·11	6·46	5·35	6·28	5·52	5·58	6·8	5·25
22	5·12	6·46	5·36	6·28	5·53	5·57	6·8	5·24
23	5·13	6·46	5·36	6·27	5·53	5·56	6·9	5·23
24	5·14	6·46	5·37	6·26	5·54	5·55	6·9	5·22
25	5·14	6·45	5·38	6·25	5·54	5·54	6·10	5·21
26	5·15	6·45	5·38	6·24	5·54	5·53	6·11	5·20
27	5·16	6·45	5·39	6·23	5·55	5·52	6·11	5·20
28	5·17	6·44	5·39	6·22	5·55	5·50	6·12	5·19
29	5·18	6·44	5·40	6·21	5·56	5·49	6·12	5·18
30	5·19	6·43	...	...	5·56	5·48	6·13	5·17
31	5·19	6·43	...	...	5·57	5·47	...	...

PHASES OF THE MOON.

			H. M.
4 Jan.	●	New Moon	7 43 a.m.
10 „	☾	First Quarter	11 53 p.m.
18 „	○	Full Moon	11 37 „
27 „	☽	Last Quarter	1 1 a.m.
2 Feb.	●	New Moon	6 36 p.m.
9 „	☾	First Quarter	2 27 „
17 „	○	Full Moon	7 5 „
25 „	☽	Last Quarter	1 24 „
3 Mar.	●	New Moon	4 57 a.m.
10 „	☾	First Quarter	7 42 „
18 „	○	Full Moon	0 28 p.m.
25 „	☽	Last Quarter	10 32 „
1 Apr.	●	New Moon	3 2 p.m.
9 „	☾	First Quarter	2 32 a.m.
17 „	○	Full Moon	2 55 „
24 „	☽	Last Quarter	5 7 „

Tropical Industries.

NEGLECTED INDUSTRIES.

CASTOR OIL PLANT (*RICINUS COMMUNIS*).

BY THE EDITOR.

Of late there has been considerable inquiry about the possibilities of the castor oil plant as a payable farm crop. There is ample evidence that the plant will thrive anywhere almost on the coast lands of Queensland. In and around Brisbane it may be seen growing and bearing heavy crops of seed in all sorts of out-of-the-way places, on the river banks, in quarries, on unoccupied allotments, but no attention has ever been given to it with a view to turning what is looked upon as almost a noxious weed to profitable account. Most people, especially children, know to their sorrow that castor oil is a most valuable medicine, but not many are aware of the large quantities which are used for lubricating and illuminating purposes. In India it is used on all the railways in the signal and carriage lamps, owing to the brilliancy and safety of the light. It burns very slowly, and thus is more economic than other oils. The plant is exceedingly hardy, and will stand a wide range of climate. The seeds have extraordinary vitality. Oil seeds as a rule quickly lose their germinating power, but the castor seed appears to be an exception. A few weeks ago I obtained two or three seeds from the Colonial Botanist, Mr. F. M. Bailey. These seeds had been in a glass bottle in the Museum of the Department cf Agriculture and Stock to my own knowledge for ten years, and Mr. Bailey thought they had lain there for fifteen years. Be that as it may, we both planted the seeds. They quickly germinated, and are now forming fine healthy plants.

In a tropical climate the plant becomes a perennial tree instead of an annual, and attains a height of from 20 to 30 feet. The best soil for castor is much like that required for the cotton plant—a rich well-drained, sandy loam. It will not thrive on heavy wet soils. As the roots penetrate very deeply, the land must be deeply ploughed and well worked. The seed is planted in rows from 6 to 8 feet apart each way, three or four seeds being planted in a hole. Before planting, the seeds should be softened by having hot water poured over them and then being left to soak for twenty-four hours. In about ten days after sowing they will germinate; and when the plants are 8 or 10 inches high, the three weakest plants must be taken up when four seeds have been put in. They grow very rapidly, and begin to bear in four months. Like the coffee and cotton plants, the castor plant would grow to an inconvenient height if left to itself. It should, therefore, be kept low by pinching back the main stem. This will have the further effect of causing the plant to throw out many more fruit spikes than it would otherwise do. I have never seen the castor oil leaves or spikes attached by any insect or fungus pest; in fact, all insects avoid it. When, however, the tree gets old, the usual scale insect, the *Coccus*, attacks the bark. They have to be dealt with, as in the case of citrus fruit and other trees, by spraying or brushing with kerosene emulsion.

When the capsules begin to turn brown, it is time to begin the harvest. This is done by cutting off the spikes and removing them as soon as possible to the barn. The work of harvesting must be done rapidly, for if the seeds are allowed to ripen on the tree the dry pods burst open, and the seeds, being liberated, fly off in all directions. This "popping" of the capsules makes the matter of freeing the seeds a very simple one. All that has to be done is to prepare a drying ground either in a shed or in the open. The ground should either be boarded or swept quite clean. When the spikes are brought in they

should be spread out on the drying ground to a depth of from 6 inches to 1 foot according to the heat of the weather. Should rain occur when out-of-door drying is being carried on, draw the spikes into heaps and cover with tarpaulin. Turn the spikes over frequently to let all get the benefit of the sun. The capsules will soon begin to burst, and in four or five days they will have shed all their seeds. All that remains to be done is to sift or winnow out the husks. The return from an acre is about 20 bushels, and the seed meets with ready sale in Europe and in the United States. A bushel of castor beans weighs 46 lb. Now that Messrs. Kitchen and Sons have established a cotton ginnery in Brisbane, and go in largely for the manufacture of cotton-seed oil, it is probable that they would also be purchasers of other oil-yielding seeds, including castor-oil seeds, sesame, cajeput, and others. At present we cannot give any idea of the price which could be obtained for castor seeds.

THE FIRST FOURCROYA PLANT AT OXLEY CREEK.

The accompanying photograph, taken in 1864, shows the first fibre plant of the *Fourcroya gigantea* family growing in the garden of the head teacher of what was then known as the West Oxley Primary School (now Sherwood). Major Boyd, who was at that time in charge of the school, obtained the plant from the late Captain Dawson, of the Black Ball ship "Saldanha," by which ship the former arrived in Queensland in 1862. The plant grew luxuriantly, and, had the cultivation of fibre plants been carried on from that date, Queensland would to-day have been exporting thousands of tons of the fibre, and hundreds of subsequent cane farmers, instead of being ruined as they were in 1872, would now have been wealthy men, for, in the forty-three years which have since elapsed, 100 acres of sisal would have produced 4,300 tons of fibre of a value of £34,400.

A GOOD POISON FOR CROWS.

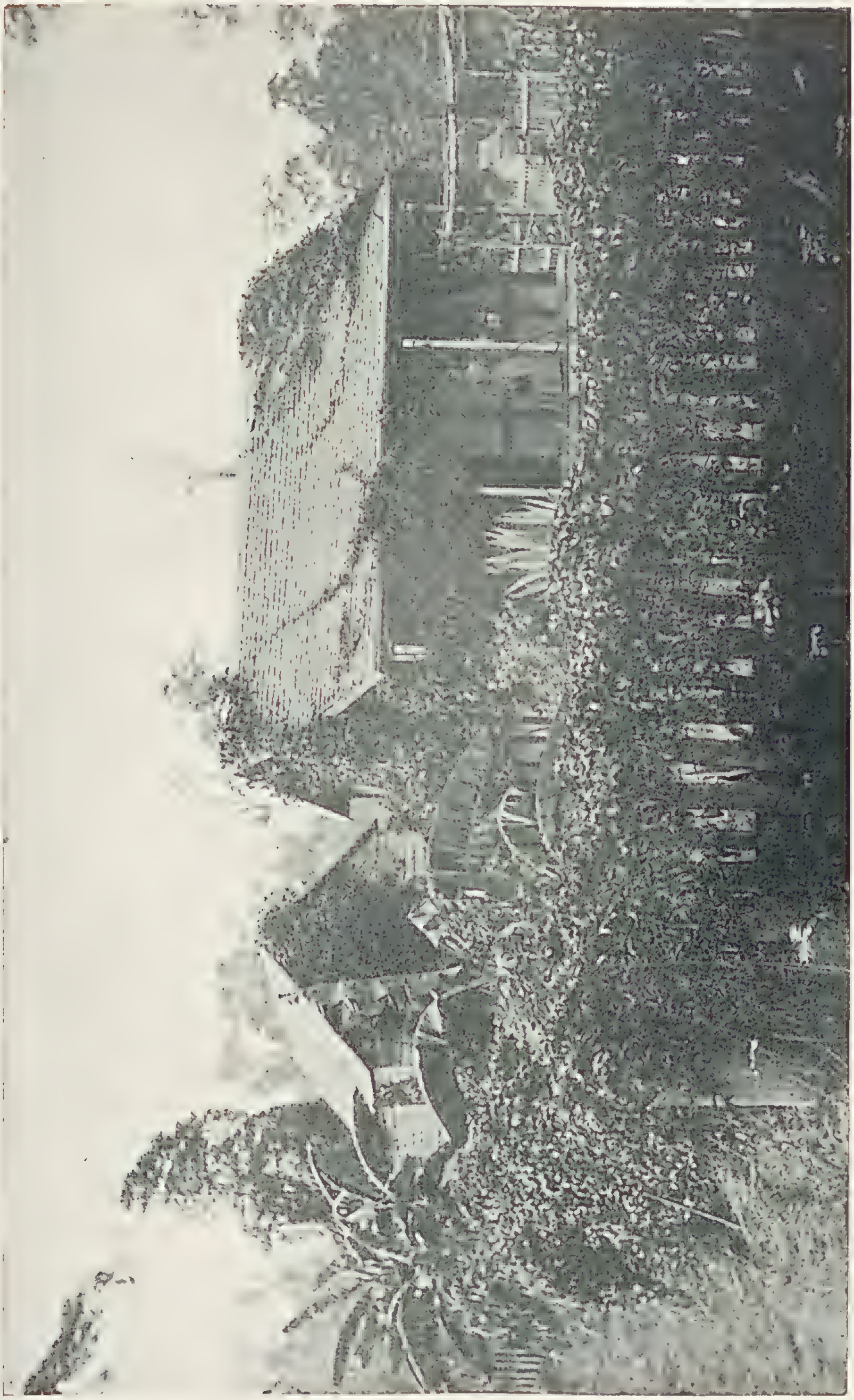
Mr. Gaskell, a farmer at Zillmere, has given us what appears to be, from a description of its action in the "Farmer and Settler," a good recipe for the destruction of crows. A Mr. Robertson reported having made certain successful experiments in poisoning these wary birds by means of a rabbit poison called S.A.P. (the initials of the manufacturers). He reported his method thus: "I put it on the carcass of the sheep after it is skinned, or I put it in fat and place the bait on a skin in the paddock. The crows take it as they take nothing else, and they die very suddenly. I have tried all other poisons—strychnine, arsenic, &c., without any visible result, but 'S.A.P.' has proved eminently satisfactory." Pastoralists report that they use it direct from the tin, rubbing it inside the freshly killed sheepskin, which they hang on the fence; or they cut a slit in some fat meat and place the "S.A.P." in that. This preparation is pleasant to the taste, and the crows do not spit it out as they do strychnine; perhaps, too, its stickiness prevents their getting it out of their mouth.

Mr. C. W. White, of Muswellbrook, uses this method: Melt fat, and, when it is beginning to thicken in cooling, mix "S.A.P." in it, stirring with a stick. When cool, make the mixture into pills about the size of a marble. Open the carcass of the sheep, so as to leave the liver bare, and smear it well with the mixture, cutting the liver with a knife; also, place the pills on the sheepskins or on the ground near the carcass.

By this means, says Mr. White, I poisoned fully 200 crows in three weeks, and there are very few crows now to be seen where there formerly appeared to be many hundreds. The crows pick up the baits, go straight to the water, and die almost immediately.

Other graziers report similar success.

Plate VI.



The First Sisal Plant at West Oxley (Sherwood), 1864.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

BY J. C. BRÜNNICH, Agricultural Chemist.

TWENTY-FIRST LESSON.

MILK: THE CHEMICAL COMPOSITION OF MILK OF VARIOUS ANIMALS. COW'S MILK: THE INFLUENCE OF VARIOUS FACTORS ON QUALITY AND QUANTITY OF MILK. MILK STANDARD UNDER HEALTH ACT. PASTEURISATION AND STERILISATION. CREAM, BUTTER, AND CHEESE.

Already in our Seventeenth Lesson we learned that milk is the normal secretion of the mammary glands of animals, and that its principal constituents may be classified into:

Water, Fat, Proteins, Sugar, and *Mineral Salts* or *Ash.*

The **fat** of milk, generally called **butter fat,** is a variable mixture of glycerine salts of fatty acids, and consists principally of the harder fats—*palmitin* and *stearin*—the glycerides of palmitic and stearic acids, and the softer fats—*olein* and *butyrin*—the salts of oleic and butyric acids. There are always present small amounts of the glycerides of other acids, as myristic acid, lauric acid, caproic acid, &c., which play an important part in giving butter fat the peculiar character, aroma, and flavour. All these fats may be split up into free glycerine and alkali salts of fatty acids (*soaps*) by treating them with alkalies (*saponification of fats*), and from the alkali salts of fatty acids the free fatty acids may be obtained by treating them with dilute mineral acids. Some of these fatty acids, like palmitic, stearic, oleic, myristic, and lauric acids, are solids, insoluble in water and non-volatile; whereas fatty acids, as butyric, caproic acids, &c., are more or less soluble in water and volatile; and the comparatively large amount of volatile fatty acids of butter fat distinguishes it from other animal fats.

The fat exists in milk in the form of exceedingly minute globules of varying size, which in an average have a diameter of about 1-10,000th of an inch, and are so numerous that one drop of milk may contain about 100,000,000 of fat globules. The size of these globules varies in the milk of the different breeds of cows; the milk from cows of the Jersey and Guernsey breed have relatively large globules, whereas the milk of Ayrshires has very small fat globules. In the milk from the same cow the size of globules changes during the period of lactation, and the size gradually decreases towards the end of the milking period.

Some scientists upheld the hypothesis that each of the fat globules is surrounded by a membrane; others, again, believe that they are enclosed by a slimy albuminous skin; but there is hardly sufficient evidence to support these theories, and it is now generally believed that the fat is in the form of a true emulsion, with the free fat globules floating in the milk serum.

The number and nature of **proteins** in milk is also a matter of dispute, but at the present day the existence of three or four proteins is generally accepted. The principal of these nitrogenous compounds is **casein or caseinogen,** which coagulates in the form of *curd* when milk gets sour. The composition of this protein is, in accordance to Chiltenden and Painter's investigations, as follows:—Carbon, 53·30 per cent.; hydrogen, 7·07 per cent.; oxygen, 22·03 per cent.; nitrogen, 15·91 per cent.; phosphorus,

·87 per cent.; and sulphur, ·82 per cent.; from which percentage amounts Richmond calculates the chemical formula to be $C_{172}.H_{274}.N_{44}.S.P.O._{55}$.

Pure casein is insoluble in water, but, having a weak acid character, it combines with bases to form soluble salts, and in milk casein exists as a neutral lime salt—calcium casein—containing from 1·4 to 1·75 per cent. of lime, CaO, and this soluble casein gives milk the peculiar white opaque appearance. When heating milk to boiling point, this protein does not coagulate, but when heating to a higher temperature under pressure coagulation can be produced. A slight coagulation on heating takes place, in producing on the surface of the milk a thin skin. If milk has reached a certain acidity, the casein coagulates when heated to 167 degrees. On the addition of dilute mineral acids to milk, casein, free from lime, is coagulated in the form of a flocculent precipitate, which redissolves easily when treated with dilute alkaline solutions. The casein is also soluble in excess of acids. The curd precipitated by weak acids encloses nearly all the fat globules. The coagulation of casein may be also produced by the action of **rennet,** which contains a peculiar enzyme chymosin, and this curd is of a different nature than that produced by acids, as it consists of an insoluble lime salt of *paracasein.* Different kinds of milk produce a different form of curd; human milk, and also the milk of mares and asses, gives a very soft flocculent casein, whereas cow's milk produces a solid mass of curd.

Milk albumin, or *lact albumin,* which closely resembles the serum albumin found in blood, exists in milk in the form of a true solution; it is not coagulated by rennet, and for this reason remains in the *whey,* which separates from the curd. This protein is not coagulated by acids, but coagulates on heating, and also precipitated from its solution by saturating it with sodium sulphate and ammonium sulphate, and by adding solutions of copper, lead, mercury salts, and by alcohol and tannin solution.

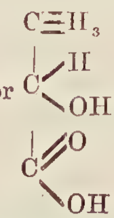
Milk globulin occurs in milk in a small quantity only, although the *colostrum,* the secretion of the udder at the time of calving, contains a larger amount of this compound. It resembles in its properties the lact albumin. Milk also contains a small amount of a **fibrin,** and also an enzyme or unorganised ferment—**galactose**—which in its action resembles pepsin in having a slow action on the milk proteins, and changing them into peptones, and for this reason plays an important part in the ripening of cheese.

Milk sugar or **lactose** is always found in milk in solution. It resembles ordinary sugar, but is less soluble in water and not so sweet. This sugar is one of the disaccharides, and by the action of dilute acids and certain ferments it consequently splits up into two monosaccharides—

$$\underset{\text{Lactose.}}{C_{12}H_{22}O_{11}} + H_2O = \underset{\text{Dextrose.}}{C_6H_{12}O_6} + \underset{\text{Galactose.}}{C_6H_{12}O_6}$$

By further fermentation the sugar is changed into lactic acid and traces of other organic acids and compounds, which are all of importance in the manufacture of cheese and butter—

$$\underset{\text{Lactose.}}{C_{12}H_{22}O_{11}} + H_2O = \underset{\text{Lactic Acid.}}{4C_2H_4(OH)COOH} \text{ or}$$



As **lactic acid** is quite easily produced from milk sugar, it must be considered a normal constituent of milk, as immediately after milking small amounts of this acid can be detected, which amount rapidly increases as the milk is allowed to stand.

The **mineral salts** of milk are left in the form of *ash* when milk is evaporated to dryness and incinerated, which consists chiefly of lime, potash, soda, and magnesia, with traces of iron in combination with phosphoric acid and chlorine. In the milk itself some of the bases are in combination with organic acids, among which citric acid is always present in small amounts. The amount of ash is fairly constant, and averages about ·7 per cent.

Many other organic compounds, like *urea*, *kreatin*, *lecithin*, &c., are always found in small quantities in normal milk; and milk, furthermore, contains always a small but appreciable amount of *carbonic acid gas* and smaller amounts of the gases *nitrogen* and *oxygen* in solution.

The composition of normal cow's milk may be shown by the following table, which also gives the average amount of the constituents in percentage of the weight:—

Cow's Milk ...
- Water. 87·1 %
- Solids. 12·9 %
  - Solids not Fat. 9·0 %
    - *Milk Serum.* (Water and Solids not Fat)
    - Proteins, 3·2 %
      - Casein, 2·5 %
      - Albumin, ·7 %
      - Globulin, &c., traces
    - Milk sugar, 5·1 %
    - Ash, ·7 %
    - Other organic compounds, traces
  - Fat. 3·9 %
- Gases Traces
  - Carbonic acid
  - Nitrogen
  - Oxygen

It is interesting to compare this composition of cow's milk with the milk of other animals, and we must note that not only the percentage of the chemical constituents shows a great variation, but that, also, the nature of these constituents, more particularly of the proteins and fats, differs in these milks. According to Richmond and others, the following table gives the **composition of various milks**:—

	Water.	Fat.	Sugar.	Proteins.	Ash.
Cow	87·1	3·9	4·8	3·4	·75
Goat	86·0	4·6	4·2	4·4	·76
Ewe	78·7	8·9	5·1	6·3	1·01
Buffalo	82·6	7·6	4·7	4·1	·90
Woman	88·2	3·3	6·8	1·5	·20
Mare	89·8	1·2	6·9	1·8	·30
Ass	90·1	1·3	6·5	1·7	·46
Cat	81·6	3·3	4·9	9·1	·58
Sow	87·0	4·6	3·1	7·2	1·05
Elephant	67·9	19·6	8·8	3·1	·65
Porpoise	41·1	48·5	1·3	11·2	·57

Cow's milk itself can show a considerable **variation in its composition**, which is influenced by many circumstances, as age, breed, health of the animals, by period of lactation, food, climate, &c.

We will now consider the influences of these various factors on the composition and more particularly with regard to the amount of butter fat.

(*a*) **Influence of Breed.**—We have already learned that the different breeds of cows show a difference in the milk with regard to the size of the fat globules, and this variation has a great influence on the separation of the cream from the milk, so that from the milk from Jersey cows the fat separates out much quicker and easier than from the milk of Holsteins and Ayrshires, in the milk of which the number of large globules is very small and very minute globules predominate.

The amount of fat also varies in the milk from the different breeds; and from the results of investigations carried out at the New York Experiment

Station the following amounts of fat was found in the milk of cows of different breeds:—

Name of Breed.	Percentage of Butter Fat in Milk. Average.	Lowest.	Highest.
Holstein Friesian	3·36	2·88	3·85
Ayrshire	3·60	3·20	4·24
American Holderness	3·73	3·49	3·92
Shorthorn	4·44	4·28	4·56
Devon	4·60	4·30	5·23
Guernsey	5·30	4·51	6·13
Jersey	5·60	4·96	6·09

The composition of the milk with regard to the other constituents is much more constant, and it was found that the amount of casein varied between 3·4 and 3·9 per cent., milk sugar between 4·8 and 5·3 per cent., and the ash between ·698 and ·760 per cent.

(*b*) **Influence of the individuality of the Cow.**—As shown by the preceding table, the variation between the lowest and highest amounts of butter fat is very considerable in some of the breeds, and this variation is frequently due to individual peculiarities of the cows. In every dairy herd certain cows may be found which give a milk much richer in fat, whereas other cows of the same breed give a yield below the average. This peculiarity is generally transmitted to the offspring, and for this reason it is of the greatest importance that every dairyman should know the yield and composition of the milk of every cow, so that he is able to pick out his best cows for breeding in order to build up a more valuable dairy herd. It is very little trouble to weigh the milk given by each cow, and the determination of the amount of butter fat by the Babcock tester can be done by anyone after a little practice. From the weight of milk and the test, the true daily yield of butter is easily calculated; and, in order to enable our farmers to do this work, I will give a short description of the milk-testing and necessary calculations in our next lessons.

(*c*) **Influence of Age.**—Between the third and fourth period of lactation the quality of milk of every cow is generally at its best, and a very slight and gradual decrease in the richness of the milk is, as a rule, the result of age.

(*d*) **Influence of the period of Lactation.**—At the time of calving the udder is filled with a peculiar slimy, viscous, yellowish liquid, the **colostrum**, which continues to be secreted for a few days after parturition and changes them rapidly into normal milk. The colostrum contains a very high amount of proteins, and is easily coagulated when heated. It also contains more ash and less milk sugar than ordinary milk. It has a distinct acid reaction, and is not easily curdled by rennet. The amount of total solids in the milk generally decreases during the first few months after calving, and then again gradually increases as the stage of lactation advances. The same applies to the amount of fat, which also increases steadily after the second or third month. At the same time the quantity of milk decreases towards the end of the lactation period.

(*e*) **Influence of milking and time of milking.**—As a rule, cows are milked twice a day—early in the morning and in the afternoon or evening—and it is generally found that the evening's milk is richer in fat than the morning's milk; at the same time the quantity of evening's milk is usually less than the amount of morning's milk. With some cows this variation may be very considerable, whereas other cows yield practically the same amount of butter fat in the two milkings. The milk first drawn from the udder is always poor in fat, and the richness increases towards the end of the milking, and the last strippings are very rich in fat. The milk first drawn has been found to contain only from ½ to 1 per cent, of fat, whereas the strippings may contain as much as 10 per cent. For this reason thorough milking with careful stripping is absolutely necessary in order to attain a maximum amount of butter fat.

Altering the hour of milking may seriously interfere with the yield of milk, and the treatment of cows before and after milking and the manner of milking itself have an effect on quality and quantity of the milk.

(*f*) **A daily variation** in the yield and quality of milk which may be frequently observed, and which in some cases may be very considerable, may be caused by a great many slight disturbances, brought about by some of the influences already mentioned, and again by changes of food, water, climatic conditions, change of the attendants and milkers, slight sickness, &c. Like in all other variations, the percentage of fat shows the greatest variations, whereas the amount of casein varies within narrow limits, and the amount of milk sugar and ash may be considered as almost constant.

(*g*) **Influence of Food.**—The quantity and quality of food given to a milking cow may have a very notable effect on the milk yield, and more particularly with regard to the quantity of milk. The improvement in the amount of butter fat will generally be between narrow limits for well-nourished cows. The effect of food on flavour has already been referred to in a previous lesson. The actual variation produced by a change of food may be very considerable, and I must draw attention to the result of some of the feeding experiments carried out at the Agricultural College at Gatton (reported in the annual report of 1907) in which the milk from ten cows of different breeds, milked for six weeks, with different rations every week, gave weekly average yields of commercial butter varying between 5·6 and 9·25 lb. per cow and per week. The latter high result was obtained when feeding with a high quality oaten chaff and bran. As a rule, such high increases are by no means permanent, and after a few weeks the average normal yield will again be reached by a gradual falling off. A change from dry feed to green feed nearly always produces an increase in the amount of fat, also feeding with oil cakes may produce a temporary rise, and a liberal judicious hand-feeding will always keep up the yield and prolong the period of milking.

(*h*) **Influence of Mating Period and Health Generally.**—During the mating period the yield of milk, due to the sexual excitement, is generally seriously diminished, just as the general state of health always has a great influence on the yield. At the beginning of any sickness frequently an enormous increase in the percentage of fat, due to a correspondingly decreased flow of milk, may be observed.

(*i*) **Influence of Season.**—The state of the weather has a marked effect on the milk flow, and a change from warm to bleak cold weather will always cause a considerable falling off if no provision is made to protect cows by stabling and rugging. Excessive heat is also detrimental, and shady shelters should be erected, if no natural shelter exists.

As milk is one of our most important staple foods, it is only natural that nearly in all countries **standards** with regard to the quality of milk sold to the public have been fixed, which protect the buyer so far that he is sure to get a milk containing at least a certain amount of butter fat and total solids, and is free from injurious preservatives. Our local **Health Act** requires the milk to contain at least **3·0 per cent. of butter fat and 8·5 per cent. solids not fat.** If we compare these values with the average composition of cow's milk, we will see that this standard is very low, and is a minimum standard of quality; and that the milk of our town supply should contain an amount of fat nearer to 3·5 and even 4 per cent.

It is not only necessary that the composition of the milk does not fall below certain limits, but it is of equal importance that the milk is *free from injurious germs* which, milk being such a complete food, find it an excellent medium for rapid development. The health of the public, and particularly of the children, can only be safeguarded by a strict *Government control over the milk supply*, and such a control must not be satisfied to get the milk periodically analysed chemically and bacteriologically, but must carry out an inspection of dairies,

stables, milking-sheds, water supply, the dairy herds, and even of the persons doing the milking. The mortality of children during their first year of life is nearly in all cities very high, and this is largely due to the milk supply, and by a strict control over the supply the death rate may be considerably reduced. At Copenhagen the death rate of children under one year, which amounted to 20·8 per cent. between 1877 and 1886, was gradually reduced to 19·0 per cent. between 1887 and 1896, 17·9 per cent. between 1897 and 1899, and was only 15·6 per cent. during 1900.

Serious epidemics—as typhoid, cholera, scarlet fever, diphtheria—have been known to have been spread by the use of contaminated milk.

Fresh milk, when kept standing, is liable to undergo certain changes, under the influence of micro-organisms, which, as already stated, develop with enormous rapidity, more particularly at our higher average temperature during summer. The addition of chemical compounds, as **antiseptics**, to make the milk keep, can for health reasons not be countenanced, and the only safe method for the **preservation** of milk is **pasteurisation** and **sterilisation**, which have the object to kill the micro-organisms.

Sterilisation means a heating of milk for some time to a temperature of 230 degrees to 240 degrees Fahr., which is best effected by heating with steam under pressure. At that temperature all germs are killed, and milk so treated can be kept for any length of time in a hermetically sealed vessel. This treatment of the milk has, however, an influence on the taste, composition, and digestibility of the milk, and for this reason a heating to a lower temperature of only 175 to 185 degrees Fahr., called *Pasteurisation*, is often employed. This heating kills only the bacteria but not the spores of such organisms, and, in order to make the process as effectual as sterilisation, the heating has to be repeated several times. All heating of the milk should be followed by cooling, and the milk should be kept at a temperature under 50 degrees Fahr. to retard the development of spores.

Cream.—When milk is allowed to stand in shallow vessels, the fat globules, which are lighter than the milk serum, will rise to the surface and form a layer of cream. This separation may be accelerated by rotating the milk very rapidly, as under the influence of the centrifugal force the light fat globules rise very much quicker, and at the same time the separation is more complete and leaves a **skim milk** containing only traces of butter fat.

The composition of the cream depends entirely on the manner in which the separator is worked, and cream may contain from 20 to 60 per cent. of butter fat. The keeping quality of the cream again will depend largely on its richness, and a cream containing only 15 to 20 per cent. of fat contains still a very large amount of milk serum, with its casein and milk sugar, which soon gives rise to fermentation, bad flavours, and various taints. The ripening of a richer cream will proceed more uniformly and favourably, the churning of such cream will give better results and produce a high-grade butter, the cream tests are easier checked; for these and several other reasons this State has fixed a standard that the cream supplied to factories should not contain less than 35 per cent. of butter fat.

Butter.—By a mechanical process of stirring, shaking, or "*churning*," the butter fat of milk and cream may be collected in a solid mass as butter. The fat globules, by being continuously knocked against each other, will adhere and collect into larger irregular granules, which eventually separate from the **butter milk.** The process of churning and the quality of the butter produced depend on a great many circumstances, as temperature, quality, and ripeness of cream, &c. During the finishing of the butter, which consists principally in a working or kneading of the butter and washing to get rid of most of the butter milk, a certain amount of salt is usually added. Butter contains a certain amount of water, which should not exceed 15 per cent.—our export butters average about 12 per cent. of moisture—and a small amount of curd and salt.

Cheese is the product obtained from milk by coagulating the casein, and separating the curd, which also encloses the largest amount of the fat, from the **whey** which contains the milk sugar, soluble proteins, and salts in solution. The coagulation of the milk is generally caused by the addition of rennet to the slightly warmed milk. The curd is finely divided, salted, and pressed; and the finished cheese allowed to ripen slowly under the influence of certain enzymes and micro-organisms. Cheese will contain more or less butter fat in accordance with being manufactured from whole milk, or skim milk, or mixture of the two.

The changes which are brought about by the ripening are very complicated: water is given off by slow evaporation, the milk sugar is changed into lactic acids, the casein is changed into more digestible proteins, and other numerous organic compounds are formed which give the cheese the peculiar flavour.

Condensed milk is a milk in which a considerable portion of the water has been evaporated. The evaporation is usually carried out at a low temperature in vacuum pans, and either with or without the addition of cane sugar.

The evaporation of milk may be carried so far as to obtain the milk in the form of a dry powder.

Questions to the Twenty-first Lesson.

1. What are the principal constituents of milk?
2. Which fatty acids are found in butter fat?
3. In what form does butter fat exist in milk?
4. What nitrogenous compounds are found in milk?
5. What is the difference between the curd precipitated by rennet and by acids?
6. What chemical elements constitute casein?
7. Which are the characteristic properties which distinguish casein and milk albumen.
8. What are the properties of milk sugar?
9. Which of the constituents of milk may show the greatest variations, and which again are always almost constant?
10. What influences cause variations in the quantity and quality of milk?
11. Which animal's milk resembles human milk in its composition?
12. What is the usual minimum standard of the composition of milk?
13. In which manner can milk be contaminated and become unfit as a food?
14. What are sterilisation and pasteurisation?
15. Why is a cream of 35 per cent. of fat fixed as a standard?
16. What changes take place in the ripening of cheese?

THE BRISBANE PRODUCE MARKETS.

The accompanying two illustrations show the busy scene on market days at the Roma-street and at the Tank-street Co-operative Produce Markets. The scene here on market days reminds one very much of the old Paddy's Market in Melbourne, fifty years ago. The whole floor space is occupied by piles of produce of every description. On all sides the auctioneers are rapidly putting up and knocking down tons of fruit, such as pineapples, citrus fruits, melons, mangoes, grapes, &c., and, in addition, piles of vegetables. The scene at the railway trucks is very animated. At Roma street the trucks run right through the sheds, and truck loads of lucerne hay, pumpkins, maize, onions, wheat, chaff, &c., are speedily disposed off or reserved for higher prices. Outside the markets long lines of vehicles of all descriptions are drawn up awaiting the purchases of their owners. On Friday mornings, the principal market day, the markets are well worth a visit, if only to note the eager bidding for specially good lines of fruit, vegetables, and general farm produce.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1906.	1907.											
	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
North.													
Bowen	11·01	2·53	3·74	1·97	0·39	3·46	2·87	Nil	1·28	0·51	0·06	3·71	6·39
Cairns	11·31	18·36	11·49	3·26	3·35	8·65	4·45	0·12	0·39	1·35	0·68	5·35	28·33
Geraldton	21·20	29·58	25·26	4·58	6·08	21·91	8·54	2·39	4 66	1·36	1·42	6·45	33·82
Herberton	10·82	10·56	11·77	2·05	0·90	1·57	2·71	Nil	0·11	0·12	0·17	3·41	9·57
Hughenden	4·76	1·98	3·83	1·17	0·16	1·34	0·95	1·16	Nil	Nil	1·66	0·66	7·75
Kamerunga State Nurs.	8·17	15·78	14·82	4·87	2·80	9·33	5·29	0·13	1·15	1·19	0·53	2·76	29·82
Longreach	0·51	1·22	0·49	1·88	0·85	0·93	0·40	0·49	0·04	Nil	1·08	2·83	9·12
Lucinda	*22·36	12·38	23·82	4·53	3·92	19·29	6·34	0·29	1·05	1·19	0·25	0·43	23·38
Mackay	12·93	2·72	6·42	8·01	1·58	*6·09	5·04	0·27	0·25	0·12	0·12	5·76	9·70
Rockhampton	5·19	4·15	4·42	3·05	0·44	0·94	4·16	0·84	0·47	Nil	0·47	3·72	4·42
Townsville	14·03	12·49	7·75	7·37	1·03	3·11	2·38	Nil	0·07	0·14	0·03	2·82	24·26
South.													
Barcaldine	1·04	3·44	0·43	1·51	0·82	0·34	2·03	0·87	0·06	Nil	1·21	1·54	11·74
Beenleigh	3·98	4·75	3·88	4·17	0·58	4·70	4·92	0·71	0·58	Nil	1·73	2·81	4·48
Biggenden State Farm	4·55	5·77	3·55	10 91	0·34	4·02	5·24	1·51	0·96	0·24	1·99	2·50	5·55
Blackall	1·96	2·30	Nil	2·78	1·69	0·20	0·36	1·36	0·06	Nil	0·88	0·80	7·47
Brisbane	3·28	2·69	5·23	5·32	0·45	4·75	2·91	0·39	0·79	0·10	1·37	4·25	3·21
Bundaberg	3·85	3·29	3·90	12·81	0·38	3·08	4·49	0·87	0·43	Nil	1·70	2·90	2·99
Caboolture	3·15	2·53	8·03	9·04	0·78	3·10	4·98	0·73	0·32	0·13	2·09	3·75	3·18
Charleville	3·71	0·85	Nil	2·75	2·29	0·26	0·90	1·04	0·76	0·02	1·69	3·88	4·09
Dalby	5·67	5·60	1·34	3·72	0·20	2·26	2·35	0·87	0·71	0·15	0·69	5·18	1·44
Emerald	1·79	7·36	3·67	7·66	Nil	Nil	2·53	1·75	0·10	Nil	0·98	1·84	6·70
Esk	5·26	2·87	6·79	3·60	0·22	5·42	2·66	0·54	0·81	0·57	0·50	3·76	3·72
Gatton Agric. College	3·45	2·62	6·44	2·71	Nil	2·80	1·85	0·54	0·56	0·15	0·71	3·01	4·55
Gayndah	2·82	3·00	1·91	6·89	Nil	2·65	3·00	1·21	0·53	0·40	0·34	4·65	6·84
Gindie State Farm ...	1·45	6·13	0·71	10·10	Nil	Nil	"2·29	1·58	0·10	0·16	0·61	1·57	4·42
Goondiwindi	4·04	5·37	1·77	6·51	0·33	1·30	1·09	1·62	0·95	0·12	1·13	2·91	3·71
Gympie	5·32	3·99	6·96	8·93	1·12	3·84	3·77	0·80	0·17	0·47	1·20	3·05	5·49
Ipswich	4·22	2·17	5·38	1·95	0·12	3·43	2·22	0·30	0·43	0·05	0·78	4·45	3·40
Laidley	4·12	2·84	4·50	3·47	Nil	2·99	1·56	0·45	0·58	0·15	0·87	1·97	2·72
Maryborough	4·39	5·52	7·84	10·28	1·25	3·21	6·05	0·64	0·93	0·25	2·74	3·49	5·81
Nambour	6·74	5·74	12·05	13·30	1·36	4·54	6·96	1·08	1·13	0·60	1·38	2·98	4·76
Nerang	6·33	9·86	6·04	7·83	1·48	7·54	5·08	1·26	1·35	0·05	0·86	3·88	4·51
Roma	4·31	6 32	2·92	1·87	0·42	0·27	2·47	1·03	0·42	0·04	1·04	3·70	2·51
Stanthorpe	4·89	4·33	3·30	5·98	1·68	1·79	2·44	1·06	1·65	0·13	1·30	5·03	3·46
Tambo	1·16	4·74	1·41	3·58	3·69	0·11	0·89	1·42	0·09	Nil	0·68	2·03	7·20
Taroom	5·49	5·16	1·10	1·86	Nil	1·01	3·76	0·70	0·04	0·10	0·67	6·82	3·79
Tewantin	9·53	6·38	15·83	11·45	1·87	7·16	7·61	1·48	0·95	0·55	1·05	3·12	7·36
Texas	1·83	4·69	4·55	6·16	0·65	0·93	1·62	1·31	0·87	0·07	1·83	2·78	2·15
Toowoomba	4·11	3·94	4·00	4·81	0·01	4·61	3·34	0·91	0·65	0·17	1·58	5·12	2·81
Warwick	5·50	3·95	2·52	5·71	0·51	1·58	1·27	1·16	1·37	0·01	1·37	3·25	3·13
Westbrook	1·48	1·79	2·91	5·13	0·02	2·53	2·53	1·04	1·78	Nil	1·08	4·76	3·23

* Compiled from telegraphic reports.

GEORGE G. BOND,
Divisional Officer.

Answers to Correspondents.

A HOME-MADE TARPAULIN.

HAY-GROWER, Helidon.—

A perfectly rain-proof tarpaulin may be made in the following simple manner:—When your canvas is put together, take 2 parts of Stockholm (not coal) tar and 1 part of neatsfoot oil. Do not use linseed oil, or you will harden the canvas. Heat the oil by itself to boiling point. Then add the tar, and stir well. Apply with a wad of oakum or soft rag. A brush is not so good. Rub the mixture well in. It will take some time to dry, but the tarpaulin will be soft, limp, and rain-proof.

SEPARATED MILK FOR HAND-FED CALVES.

HY. BROWN, Gympie.—

When skim milk is fed to calves, there is something wanting in it, and that something is the butter taken out of the whole milk in the shape of cream. It follows, therefore, that this loss must be made up by some supplementary feed. Mixing raw bran or chopped oats with the milk inflicts injury upon the calf by scouring. At from one to three weeks old most calves will eat a mixture of chopped oats, ground linseed, and bran in a dry state. The chewing necessary fits the feed for proper digestion, and prevents all risk of scouring, such as occurs when skim milk is gulped down hurriedly from the feeding pail. It has been conclusively shown that this risk can be avoided by mixing 2 oz. of cod liver oil with each 3 gallons of milk. Calves so fed will never scour, but gain as much as 1·38 lb. in weight daily.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JANUARY. Prices.
Apples, Imported, per packer	18s. 6d.
Apples, New England, per packer	4s. to 10s.
Apples, Tasmanian, Cooking	...
Apricots, Local, per packer	...
Bananas, Local, per bunch	6d. to 2s.
Bananas, per dozen	2d. to 2½d.
Cherries, per quarter-case	...
Custard Apples, per quarter-case	6s. to 7s.
Grapes, per lb.	1d. to 5d.
Lemons, per case	2s. to 6s.
Lemons, Rough, per case	1s. 3d. to 2s.
Mangoes, per case	...
Nectarines, per quarter-case	3s. to 6s.
Oranges, Imported, per case	22s. 6d.
Passion Fruit, per quarter-case	...
Pears, per quarter-case	10s. to 12s.
Peaches, per quarter-case	3s. to 5s.
Peanuts, per lb.	...
Persimmons, per case	...
Pineapples (rough leaf), per dozen	6d. to 1s. 6d.
Pineapples (smooth leaf), per dozen	1s. 6d. to 3s. 6d.
Pineapples, Ripley's	1s. to 3s.
Plums, quarter-case	...
Quinces, per case	...
Rockmelons, per dozen	1s. to 5s.
Rosellas, per bag	...
Strawberries, per tray	...
Tomatoes, per quarter-case	6d. to 2s.
Watermelons, per dozen	2s. to 6s.
SOUTHERN FRUIT MARKET.	
Apples, Tasmanian, per case	...
,, American, per case	...
Apricots, per quarter-case	...
Bananas, Fiji, per case	13s. 6d. to 14s.
,, ,, per bunch	5s. to 7s. 6d.
,, Queensland, per bunch	4s. to 5s.
,, ,, per case	12s. to 13s.
Cherries, per quarter-case	...
Gooseberries, Tasmanian, per quarter-case	...
Lemons, Ordinary, per gin case	...
Mangoes, Queensland, per case	5s. to 6s.
Mandarins, Queensland, in Melbourne, per case	...
Oranges, Queensland, per case	14s.
Oranges, Common, per case	...
Oranges, American Navel, per case	16s. to 18s.
Pears, Victorian Vicars, per box	...
Passion Fruit, per quarter-case	4s.
Peaches, per case	...
Pineapples, Queensland Queen's	5s. to 7s.
Pineapples, Choice (Common)	5s. to 6s.
Pineapples, Medium	3s. to 5s.
Peanuts, per quarter-case	11d. to 1s.
Rockmelons, per double case	5s. to 6s.
Tomatoes, per quarter-case	3s. to 5s.
Watermelons, Queensland, per dozen	8s. to 10s.

Plate IX.

DEALERS' CARTS AT THE BRISBANE PRODUCE MARKETS, ROMA STREET.

Plate X.

The Brisbane Co-operative Produce Markets, Turbot street.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JANUARY.

Article.		JANUARY. Prices.
Bacon, Pineapple	lb.	8½d. to 10d.
Bran	ton	£5 5s. to £5 10s.
Butter, Factory	lb	10½d.
Chaff, Mixed	ton	£6 to £6 10s.
Chaff, Oaten	„	£6 10s. to £6 15s.
Chaff, Lucerne	„	£4 to £5.
Chaff, Wheaten	„	£4 10s. to £5 10s.
Cheese	lb.	6½d. to 8½d.
Flour	ton	£12.
Hay, Oaten	„	£7 10s. to £8.
Hay, Lucerne	„	£2 10s. to £3 10s.
Honey	lb.	2d. to 2½d.
Maize	bush.	3s. 10d. to 4s. 7d.
Oats	„	3s. to 4s.
Pollard	ton	£6 to £6 10s.
Potatoes	„	£6 to £9.
Potatoes, Sweet	„	...
Pumpkins	„	...
Wheat, Milling	bush.	5s. to 5s. 2d.
Wheat, Chick	„	5s. to 5s. 6d.
Onions	ton	£8 15s. to £9.
Hams	lb.	1s. 1d.
Eggs	doz.	7½d. to 8d.
Fowls	pair	1s. 10d. to 3s. 6d.
Geese	„	6s. 6d. to 7s. 6d.
Ducks, English	„	2s. 6d. to 3s.
Ducks, Muscovy	„	3s. 9d. to 5s.
Turkeys (Hens)	„	7s. to 8s. 6d.
Turkeys (Gobblers)	„	10s. to 18s.

ENOGGERA SALEYARDS.

Animal.	DECEMBER. Prices.
Bullocks	£10 5s. to £11 15s.
„ (Extra Prime)	£12 7s. 6d. to £14 12s. 6d.
Cows	£8 15s. to £10 15s.
Merino Wethers (Woolly)	22s. 9d.
C.B. „	23s.
Merino Ewes	18s. 9d.
C.B. „	15s. 9d.
Shropshire Ewes (Very Good)	26s. 6d.
Lambs	17s.
Pigs (Porkers)	27s. 6d.

Farm and Garden Notes for March.

FIELD.—Take every opportunity of turning up the ground in readiness for sowing and planting winter crops. The main crop of potatoes should at once be planted. As the growth of weeds will now be slackening off, lucerne may be sown on deeply-cultivated soil. The latter should be rich and friable, with a porous subsoil. The land should be thoroughly pulverised. Do not waste time and money in trying to grow lucerne on land with a stiff, clay subsoil. Prepare the land a couple of months before sowing, care being taken to cross-plough and harrow before the weeds have gone to seed. This ensures a clean field. Sow either broadcast or in drills. In the former case, 20 lb. of seed will be required—in the latter, 10 lb. A good stand of lucerne has been obtained with less quantities. Lucerne seed is worth from £2 16s. to £3 5s. per cwt. Should weeds make their appearance before the plants have sent down their tap roots, mow the field. Before they can again make headway enough to do any damage, the lucerne will be strong enough to hold its own against them. Harrow and roll the land after mowing. Gather all ripe corn. It is now too late to sow maize, even 90-day, with any certainty of harvesting a crop of grain. Rye grass, prairie grass, oats, barley (in some districts, wheat), sorghum, vetches, carrots, mangolds, and swede turnips may be sown. In Northern Queensland, sow tobacco seed, cowpea, Carob beans, sweet potatoes, opium poppy, &c. Sow Anatto, Jack fruit, and plant Kola nut cuttings. Some temperate zone vegetables may be planted, such as egg plant, potatoes, &c. Coffee-planting may be continued. Harvest kafir corn and paddy.

FLOWER GARDEN.—Now is the time to plant out bulbs. A complete garden could be furnished with these charming plants, which are to be had in every colour and variety. Amongst the many are:—Amaryllis, anemone, arum, babiana, crinum, crocus, freesia, ranunculus, jonquils, iris, ixias, gladiolus, narcissus, Jacobean lilies, tigridia, tritonia.

All bulbs like well-drained, somewhat sandy soil, with a plentiful admixture of leaf mould. Herbaceous plants and annuals which it is intended to raise from seed should be sown this month. Such are:—Antirrhinums (Snapdragon), asters, cornflowers, dianthus, larkspur, daisies, cosmia, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas. Cannas now planted will require plenty of food in the shape of liquid manure. Put in cuttings of carnations. Chrysanthemums require attention in the way of disbudding, staking, watering with liquid manure, &c. Growers for exhibition will thin out to a few buds and protect the flowers from rain and sun. Dahlias should be looking well. To secure fine blooms, disbudding should be done.

Now, as to climbers which may now be planted. These are:—Allamanda Schotii (beautiful yellow); Antigonon leptotus, a charming cerise-coloured climber; Aristolochia elegans, handsome as an orchid and easily grown; Aristolochia ornithocephala (Dutchman's Pipe), very curious, large, always attracts attention; Asparagus plumosa, grows in any shady place; Beaumontia grandiflora, splendid white flower, grand for a fence, will grow 50 feet high; Bignonias of several kinds; Bougainvilleas, with their splendid leafy, pink and purple flowers, rapidly clothe a fence or unsightly shed with a blaze of blossom; Quisqualis indica, a fine creeper, flowers pink, changing to white; Wistaria, purple and white. Most beautiful is the Bauhinia scandens, rarely seen about Brisbane. We grew a plant of this climber at Nundah, and it soon closed in the front of the veranda for a distance of over 80 feet. The leaves are very small, and in the flowering season it presents almost a solid mass of beautiful round bunches of blossom, something like the hawthorn bloom—pink and white. It

seeds freely, but the seeds are difficult to germinate, and when they have produced a plant it is still more difficult to rear it. A rooted sucker from the main stem will in all probability grow.

KITCHEN GARDEN.—During this month a very large variety of vegetable seeds may be sown in readiness for planting out where necessary in the autumn, which begins on the 20th of March. All unoccupied land should be roughly dug, and, where required, add well-decomposed manure. Transplant cabbage, cauliflower, celery, &c. Sow French beans, beet, carrot, turnips, radish, cabbage, cauliflower, cress, peas, mustard, &c. Former sowings should be thinned out and kept clear of weeds. Mulch round melon and cucumber beds with a good dressing of long stable manure, as it assists in keeping the fruit clean and free from damp. Cucumbers, melons, French beans, and tomatoes should be looked for every day and gathered, whether required or not, for, if left on the vines to perfect their seeds, the plants will soon cease to be productive, or will form inferior, ill-shaped, and hence unsaleable fruit.

Orchard Notes for March.

By ALBERT H. BENSON, M.R.A.C.

THE SOUTHERN COAST DISTRICTS.

The marketing of the main crop of pineapples will continue to occupy the attention of growers, and, as it is probable that the plantations have been allowed to get somewhat dirty during the previous month, they should be cleaned up as soon as ever the crop has been got off. The first of the new crop of citrus fruit will be showing signs of ripening towards the end of the month, and, as the fruit during this period of its growth is very liable to the attack of insect pests of various kinds, it is important that steps be taken to prevent loss arising from this cause as far as possible.

Large sucking moths of several kinds attack the fruit as soon as it shows signs of ripening, and, as they always select the first fruit that shows signs of colouring, it is a good plan to gather a few forward fruit, and to ripen them up quickly by placing them on a barn floor and covering them up with bags or straw. They will turn colour in a few days, and develop the characteristic scent of the ripening fruit. The fruit so treated should be hung up in conspicuous places in the orchard as trap fruit, as not only will it attract the moths, but also fruit flies. The moths will be found clustered round the trap fruits in large numbers, and can then be easily caught and destroyed. Fruit fly will also puncture such fruit, and, if the fruit is destroyed before the larvæ reaches maturity, a later crop of these insects is prevented from hatching out. Fruit flies may also be caught in large numbers by means of such artificially-ripened fruits. The fruits are smeared with tanglefoot and hung about the orchard. The fly, attracted by the colour, settles on the fruit, and is caught in a similar manner to house flies on specially prepared sticky paper. These simple remedies, if carefully carried out, will result in the destruction of large numbers of sucking moths and fruit flies.

The yellow peach moth, that does such damage to peaches in spring, and that attacks corn, sorghum, cotton bolls, custard apples, and many other plants and fruits, often does a lot of damage to citrus fruits. It acts in a very similar manner to the second and later generations of the Codling moth of pomaceous fruits, in that it lays its eggs where two fruits touch, under the shelter of a

leaf on the fruit, at the stem end of the fruit, and, in the case of navel oranges, in the navel itself; in fact, anywhere that there is a likelihood of the egg not being disturbed. The egg hatches out into a small spotted caterpillar, which eats its way into the fruit, causing it to ripen prematurely and fall off. Where two fruits touch, it often eats into both and destroys both; and it frequently leaves one fruit to go and destroy a second. It is a very difficult insect to deal with, owing to the number of fruits and plants on which it lives, but, as far as citrus fruits are concerned, the best remedy is undoubtedly to spray the fruit with a remedy that will destroy the young insect when it starts to eat the skin of the fruit. Bordeaux mixture has been found efficacious, but I am of opinion that spraying with Paris green and lime, Kedzie's mixture, or arsenite of lead will also have good results. The latter poison is, in my opinion, well worth giving a thorough test, as it sticks to the fruit and leaves for a long time. Bordeaux mixture, either alone or in conjunction with Paris green or Kedzie's mixture, is, however, a good remedy, as not only will it destroy the larvæ or prevent the moth from attacking the tree, but it is also the best remedy for black brand or melanose, as well as tending to keep all other fungus pests in check. Fight fruit fly systematically, both by means of the sticky fruit already recommended, and by gathering all fly-infested fruit, such as guavas, late mangoes, kumquats, &c., as well as any oranges or mandarins that may have been infested, as if kept in check now there will be little less throughout the season. A little fruit will be marketed towards the end of the month. See that it is gathered and sweated for seven days before marketing, and don't gather it too immature. Beauty of Glen Retreat mandarins are often gathered and marketed as soon as they show signs of colouring. They are then as sour as a lemon, and anyone who is unlucky enough to buy them will sheer off mandarins for some time to come. This variety should not be gathered till thoroughly ripe, as when marketed in an immature state it spoils the market, as it puts people off eating citrus fruit. Clean up the orchard after the summer rains, and have everything ready for the marketing of the crop. See that there is a good supply of clean, dry case timber on hand, as one of the greatest sources of loss in shipment is packing fruit in green cases.

Strawberry planting can be done throughout the month. Plant such berries as Federation on the lowest ground, and Aurie, Anetta, Trollop's Victoria, Glenfield Beauty, on warm well-drained soils. Prepare the land thoroughly, so that it is in perfect tilth, and in a fit state to retain moisture well, as in this, as much as anything, the success of the crop depends. When new orchards are to be planted, get the land ready; not the clearing, which should have been done months ago, but the working of the land, as it is advisable to get it thoroughly sweetened before putting the trees in.

TROPICAL COAST DISTRICTS.

The Notes for February apply equally to March. See that bananas are netted. Keep down weed growth, and market any sound citrus fruits. Clean up the orchards as well as possible, and keep pines clean. Get land ready where new orchards are to be set out, as tree-planting can be done during April and May. Pines and bananas can still be planted, as they will become well established before winter.

SOUTHERN AND CENTRAL TABLELANDS.

Finish the gathering of the later varieties of deciduous fruits, as well as grapes. Clean up the orchard, and get ready for winter. Get new land ready for planting; and when there are old, dead, or useless trees to be removed, dig them out and leave the ground to sweeten, so that when a new tree is planted to replace them the ground will be in good order.

In the drier parts, where citrus trees are grown, keep the land well worked, and water when necessary.

Agriculture.

No. 5.—MARKET GARDENING.

BY A. J. BOYD.

SALSAFY AND SCORZONERA.

Salsafy is very generally known as the "Oyster Plant." The roots are boiled like carrots or parsnips, or half boiled and grated fine; then made into small fat balls, dipped into batter, and fried like oysters, which they much resemble in flavour.

The cultivation is the same as for carrots. The seed is sown in drills, from 8 to 12 inches apart, 2 inches deep, and, when the young plants are up, thin them out to 3 or 4 inches apart in the row.

Use them as required until the roots begin to grow, when they should be taken up and stored like carrots and parsnips.

The seed may be sown from March to August, and the plant comes to maturity in 150 days.

Scorzonera or "Black Salsafy" is cultivated in the same manner. Both are grown exclusively for the roots, which may be boiled and served plain like parsnips. Before cooking, the outer coarse rind should be scraped off, and the roots soaked in cold water for a few hours to extract their bitter flavour.

OKRA.

Okra, sometimes called Okra Gumbo, is of easy culture, and grows freely, bearing abundantly in any ordinarily good garden soil.

This vegetable is rarely grown in Queensland, but in the East and West Indies it is used in all households for soups and stews. The pods are used before the seeds become ripe and dry, whilst still green and tender. The plants should be from 2 to 2½ feet apart each way. Keep down the weeds, and loosen the soil among them occasionally.

Sow in September and up to the end of November.

The pods may be cut into slices and dried for winter use.

CHOKOS.

The Mexican name for this vegetable is "Chayote." In the West Indies it is called "Chocho," which is the nearest approach to the Queensland corruption, "Choko." It is a climbing vine, producing an immense quantity of light-green foliage, and is of very vigorous growth. It is one of the most prolific bearers amongst the *Cucurbitaceæ*, from which family it differs in that it has only one seed. It is very easily propagated by planting the whole fruit. When the seed has germinated, a plumule or sprout emerges from between the cotyledons, and this sprout will continue green for a very long period, even when lying unburied. The plant thrives in a remarkable degree on our rich scrub soils, notably on the Blackall Range, where the fruit is grown in large quantities for feeding dairy cattle, pigs, and horses. There the chokos are pitted by the farmers. In the pits they sprout very soon, but remain perfectly fresh and good for a long time. A prodigious number of fruits are gathered from a single vine, as many as 400 having been gathered in the season. No disease of any kind has been known to attack the plant in Queensland.

The fruit has a recognised place as a table vegetable in this State. It is cooked in the same manner as cucumbers and vegetable marrows.

Plant the whole fruit in August or September, and train the vines over a strong trellis, over a fence, or over outhouses. The fruit will be ready for use in 60 days.

YAMS.

The cultivation of yams is only carried on to any extent in Northern Queensland, and there only to supply the kanaka labourers with their favourite island diet. Now that the kanakas have been deported to their island homes, the area under yams is considerably curtailed, as the white population in this State has never taken to this tuber as a regular article of diet, as in the case of the sweet potato.

The yam requires a rich sandy loam, deep and friable, for the rich tubers will not be able to develop properly in stiff heavy soils. It will grow within a wide zone, extending 30 degrees north and south of the Equator. Most of the yams are propagated in the following way:—

When the tubers are ready to be dug up, the tops are cut off with the vines attached, and care is taken not to disturb the plant more than is necessary. The top is then again buried in the ground, and it and the base of the vine are moulded up with good soil and left undisturbed for about three months, when another yam, called the "head," will be found to have been produced. Plants are then made by cutting the head into pieces, care being taken that each cutting possesses an eye or bud, from which the new plant develops. The land is usually lined out in rows 3 feet apart, the plants being set at distances of 3 feet in the rows. September is the best planting season, and the tubers take from 150 to 250 days to mature. The plants require an occasional moulding up.

PEANUTS.

Peanuts, or, as they are called, earth and ground nuts, do best in a rich sandy loam. In August make hills about 3 feet apart, and, having shelled the seeds, drop three or four in each hill, covering them to a depth of 2 inches. A fair average crop is 2,000 lb. of nuts per acre, but a crop of 4,000 lb. is not at all uncommon. The cost of cultivation is comparatively trifling.

The peanut requires, as stated, a fairly rich sandy loam, and the land should be cultivated as for potatoes, although shallower ploughing is needed—say, from 4 to 5 inches. The object of this shallow ploughing is to secure a firm bed on which the nuts may rest. If the ploughing is too deep, the roots run down to some depth, the nuts take longer to ripen, are more difficult to harvest, and are subject to many dangers. When the soil is reduced to a good tilth, the land should be marked off in rows 4 feet apart, and cross-rows should be drawn, about 2 feet apart, and the nuts planted as described above in the case of hills. In about a fortnight the young plants will be up. If any misses occur, they should now be filled up, and then the ground must be kept clean until the running vines render hoe work needless. The plant is remarkable for its habit of burying its seed pods in the ground to ripen. The varieties which do this are more difficult to harvest than those which have not this peculiarity.

The planting season may be extended in Queensland from August to November.

Harvesting.—When the vines have quite died off, either naturally or after a frost, harvesting should begin.

The tops, or haulms, are cut off with a reaping-hook, and may be used as fodder for cattle and horses, which are very fond of it. The stems to which the nuts are attached may be drawn out by hand where only a small area is grown, and the bunches laid down near the row. Next day they are laid on a straw platform, and a fortnight later the nuts are stripped off. Where large areas are planted, a much cheaper way of unearthing the nuts is to run the plough under the roots, turning up the nuts still adhering to the stems. They are then dealt with as above.

The nuts must now be thoroughly dried during several days. If not properly dried, they turn dark, and lose 50 per cent. of their value. The colour is of great importance. The hulls should be bright and clean; hence the

nuts grown on light sandy soil will bring a higher price than those grown on black soil.

A bushel of nuts will weigh 22 lb., and an ordinary corn sack will hold 90 lb. The minimum price of good nuts is 2d. per lb., or £18 per ton for good, ripe, dry, bright-coloured nuts.

From 12,000 to 19,000 nuts, according to distance apart and the number of nuts planted per hill, will be required per acre.

The nuts take six months to ripen.

Although peanuts are usually grown as a field crop, I have included them among the ordinary market-garden crops, because small quantities can generally be sold in the markets at about 2½d. per lb.

The best variety for eating purposes is the North American Red; for oil production, the Carolina.

HORSE RADISH.

In European countries, and especially in England, no dish of roast beef would be considered perfect unless garnished with scraped horse radish or with the adjunct of horse-radish sauce. In this State probably not one in a hundred of our beef consumers know what kind of a vegetable it is, or, if they know the name, they are ignorant of the uses to which it is put.

A deep, loose, strong soil, with plenty of moisture, is considered the most suitable for the growth of horse radish. In the autumn the soil is forked over to the depth of 2 or 2½ feet, and well-rotted farmyard manure is thoroughly worked in to the depth of 1 foot or more. A narrow bed, 3 feet wide, is then prepared, and late in August or early in September the horse-radish cuttings are planted along both edges, alternating so that they are not opposite to each other across the bed. The cuttings are 12 inches long, and are set out 18 inches apart. Instead of being placed vertically in the ground, they are planted in a slanting position, with the upper and larger end covered by only an inch of earth, while the lower lies 3 inches or 4 inches deep.

As a consequence of this slanting position, the new roots thrown out from the lower end of the cutting strike vertically downwards, making nearly a right angle with the main stem, and it is from these slender roots that the new cuttings for the next season's planting are made. During the summer the ground is kept free from weeds, and the surface of the ground is slightly stirred. Towards the end of November the bed is gone over carefully, and each cutting uncovered separately and slightly raised out of the ground with the hand. Care is taken not to injure the perpendicular roots which have formed from the lower ends. All small rootlets are rubbed off from the body of the root with a woollen cloth, those that are too large to be removed in this manner being cut close with a sharp knife. A small quantity of powdered charcoal is scattered over the cut surfaces to prevent decay, and the cutting is again covered with earth as before. In order to keep the new roots of a uniform diameter, and to prevent their striking deep into the soil and becoming too slender, the beds are sometimes underlaid with a porous cement pavement, 1½ foot below the surface of the ground. This pavement checks the growth of the young roots and causes them to thicken.

The roots are allowed to continue their growth till the end of February, when the harvest begins. The cuttings which have been two seasons in the ground—first as vertical roots and afterwards in the slanting position—are by this time large enough for market. In digging the horse radish a long-bladed mattock or spade is used. This enables the digger to remove not only the obliquely-planted cutting, which is the marketable product, but also the new roots from its lower end, of which the cuttings for the next crop are to be made. The average thickness of good marketable horse radish is 2½ inches at the large end and 1½ inch at the other.

Horse radish may be kept quite fresh for several months by planting the roots in a cool cellar in moist sand, and the cuttings held over for the spring planting may be kept in the same way.

MUSHROOMS.

Mushrooms grow profusely in many parts of Queensland, and are eagerly sought after in the neighbourhood of cities and towns. Dairy farms and horse paddocks are the most prolific localities for these excellent vegetables. Growing mushrooms in the open is one of the simplest forms of gardening. All that has to be done is to prepare a bed, "spawn" it, and the mushrooms will appear in due season—namely, in the autumn. But mushrooms really grow all the year round, and may be gathered in quantities in the spring season; hence beds should be prepared in time to admit of a crop appearing at the most suitable time. The spawn is obtained from the parent plant, and much resembles a cobweb. This is preserved in bricks made of a mixture of turf and manure, and will last a long time in this condition.

Preparing the Bed.—During January or February a quantity of horse-droppings should be collected. They must not be piled up in a heap, but rather be spread out thinly under a shed until required. Dig trenches 1 foot deep and about 4 feet wide, and into the trenches throw the droppings to a depth of 9 inches. Then ram or tread them down firmly to exclude the air as much as possible, thus preventing the droppings from heating too much. Now, break up the spawn bricks into pieces of the size of a small marble, and set them a foot apart, almost on the surface of the manure. If no rain should come, give the beds a fair sprinkling of water, and a few days afterwards cover the manure and spawn with 3 inches of fine soil. In Queensland we often have heavy rains in February, and too much water is injurious to the spawn, so it would be well to provide some shelter for the beds. If the weather is suitable, within a month or six weeks after covering up the spawn with earth, tiny white buttons spring up at intervals all over the bed, the spawn being distributed in spaces of about 1 foot apart. These little buttons rapidly develop into mushrooms, and in about three weeks they are large enough to cut for the market.

One of the strangest things about mushrooms is that they can be produced spontaneously, as it were, from a bed of manure and earth properly prepared and cared for. Without spawn or seed of any kind, if the work is properly done, after a few weeks the mushrooms will spring up from a bed of this kind, and for about three weeks they can be gathered; but that exhausts the bed, and you will never get another mushroom from it unless spawn is introduced.

Cellar Cultivation.—Wherever there is a cellar or dark recess beneath the house, excellent mushrooms may be produced in large quantities. The first requisite is equable temperature; the next, dampness; and the third, gloom. The best way to prepare the cellar is to build shelves all round the walls and in the centre; indeed, anywhere, so long as room is allowed to pass between the shelves. On these shelves, boxes a foot deep are placed. They may be of any suitable width and length, but they must have the depth. As soon as the boxes are in position, the next thing is to prepare the beds for the reception of the spawn. I have already shown how to prepare the bed in the open, and the same method will serve for the cellar bed, the spawn being put in a little further apart than was the case in the garden, the reason being that we shall have a larger crop on a given area, owing to the superior conditions of temperature and damp; 16 inches is not too great a distance between the fragments of spawn. The temperature must be kept at from 60 to 70 degrees Fahr., and such a temperature is easily maintained in a cellar, even in our hottest months. Next comes the question of dampness. This is essential. But it is not always necessary to water the beds. The plan adopted in Paris cellars is to water the floor and also to sprinkle the walls. The same is done in America.

When the mushrooms are being gathered, they should not be picked by hand. This often results in the top breaking away from the stem, and thus the market value is lessened. They should be snipped off about half an inch below the head. A long stick with a sharp brad in the end is used to harpoon each button or formed mushroom.

Mushroom-growing is a very profitable business. The spawn can be purchased from Queensland seedsmen in small quantities for 1s. per 1-lb. brick; but intending growers can produce the spawn artificially in this way:—

Mix two or three kinds of dung—horse and sheep, or horse, sheep, and cow dung—and heap up under cover, treading it down as the heap grows. Then cover the lot with fermenting horse dung or with bags. In a month or six weeks, if the compost heap has not been over-heated, you will find on taking out a handful of it that there are small white threads running through the dung. This is the mushroom nucleus. It will not keep, however, and should be used at once. In a stable which had not been cleaned out for some time, I have found the white mushroom fibres on breaking a piece of the hard trampled dung. Seeing, then, that mushrooms can so easily be raised in any odd, dark, damp shed, and that there is always a ready sale for them in the cities, the market gardener cannot do better than devote a short time each day to caring for them.

HERBS.

No market garden is complete without herbs. These are generally easy to raise from seed. If plants can be obtained, so much the better. They may be sown at any time between April and August. Each particular variety should have a small bed, about 3 feet wide, to itself.

Where plants are not obtainable, sow the seed in rows drawn a foot apart, just deep enough to cover the seed. When the plants are up, thin them out to a foot apart. See that they are well watered during the summer; keep the surface of the soil loose, and mulch. In autumn or in early spring take them up and divide the roots, planting them at 18 inches apart. Continue making new plantings every winter, as these will take the places of those which may die out during the hot summer.

The most useful are—Fennel, marjoram, mint, parsley, sage, thyme, and rosemary.

Fennel is propagated from seed or by division of the roots.

Marjoram.—Sow in light soil and thin out, or in boxes. It grows and spreads rapidly.

Mint.—This herb is propagated by division of the roots. It will grow in any fair garden soil, and spread so rapidly as to become in a very short time a nuisance. The roots run a long distance underground, and send up shoots at every joint.

Parsley.—This most useful herb may be sown two or three times a year, but preferably in February or March and in August. Sow thinly in drills 10 or 12 inches apart. When the plants are strong, cut them down to induce strong curled foliage. If not regularly cut, parsley will go to seed in one season.

Sage.—Like other shrubby herbs, sage may be grown from seed, by division of the roots, and by cuttings.

Thyme and rosemary are propagated in the same manner.

DRYING HERBS.

In order to ensure a constant supply of culinary herbs, independently of the weather, recourse may be had to drying them. Gather the herbs on a dry day as the flowers are beginning to open. Look them over carefully, and remove dead leaves and any foreign matter. Tie in little bundles; hang these up in a dark dry place where a draught can get at them. When quite dry, rub off the leaves and sift and clean out all dust and twigs; then place the leaves in wide-mouthed bottles and seal airtight. Do not on any account dry herbs by sun or fire heat. If they are treated as here directed, they will keep their flavour indefinitely.

INSECT PESTS AND DISEASES OF CULINARY CROPS, AND THEIR REMEDIES.

It must not be supposed, after all has been done as suggested in the foregoing pages, there will be nothing to prevent all the crops growing luxuriantly right through the season. So far from that, the market gardener will have to contend with many kinds of pests and diseases. Caterpillars, slugs, fly, locusts, birds, worms, scale insects, and fungoid diseases of various sorts will all attack your garden in turn, and these must be destroyed as soon as they appear, or there will be very little, if any, profit.

What is the best way of fighting them all?

In a small garden you may do a great deal by picking off the caterpillars, but the slugs (particularly the voracious *Vaginula*) are night intruders, and must be dealt with in a different manner.

Whilst recommending the following remedies for the various diseases and pests affecting vegetables, I at the same time recommend gardeners to study the writings of scientific vegetable gardeners, and make use of the remedies suggested by them. By so doing you will find that you will be successful with your garden; and, if you have also a farm to attend to, you will have plenty of time to grow field crops as well.

The *Vaginula* Slug.—To effectually destroy this nocturnal visitor, the use of "tobacco waste" may especially be recommended. This is composed of the discarded mid-rib of the tobacco leaf, after it has been cured. It is worth about 5s. per load at the tobacco factory.

Tobacco dust is also a certain destroyer of the slugs. To apply the waste or dust, scatter either on the soil round the plants or beds to be protected. When the slugs come in contact with it, they secrete a thin film of mucus from their feet as if to protect them from injury, but the tobacco waste is fatal to them. You may also make a decoction of tobacco from the waste in this way:—Fill a barrel with the stems, and cover with water, and boil it down to the strength required. If you want a very strong solution, fill the barrel with fresh stems, and fill up with the water already used.

Aphis and Cabbage Moths.—Spray with 2 fluid ounces of black-leaf tobacco to 1 gallon of water. Spraying with the resin and soda wash is also very satisfactory. The wash is prepared as follows:—Resin (pounded), 5 lb.; caustic soda (70 per cent.), 1 lb. (or washing soda, 3 lb.); fish oil, 1 pint. Water to make 25 gallons. Boil the above ingredients with water enough to cover for one or two hours, adding water slowly if there is a tendency to boil over. The compound will assume the colour of black coffee. Occasionally pour a small quantity of the mixture into water. If it is not boiled sufficiently, it will form a ropy mass at the bottom of the vessel. Dilute with warm water, stirring all the time, to one-third. This first bulk of 8 gallons makes a stock mixture to be diluted to the full amount when used. A very fine spray must be used.

Turnips are especially liable to the attacks of aphides, which, if not checked, spread with alarming rapidity, and will soon exterminate a whole field. Spraying with the resin and soda wash, with kerosene emulsion, or with tobacco water, on first noticing the pest, will usually effectually get rid of it.

Kerosene Emulsion.—Kerosene, 2 gallons; soap, ½-lb.

Spraying with Paris green will effectually destroy the larvæ which riddle the leaves of cabbages, cauliflowers, &c., but it must be borne in mind that Paris green, being an arsenical poison, must not be used on crops of this kind within five or six weeks of their being ready for market. The danger from insect pests will be considerably lessened if the location of these crops be altered every season.

If Paris green is dusted from a bag in the proportion of 1 oz. to 100 oz. of flour, and just enough applied to make a slight show on the leaves—say, 1 oz. of the mixture to twenty-eight heads of cabbage—the aphis or worms will all be killed in the course of two or three days, while the average amount

of poison on each cabbage will be about one-seventh of a grain. Fully one-half of the powder will fall on the outside leaves and on the ground, and thus an individual would have to eat about twenty-eight cabbages in order to consume a poisonous dose of arsenic, even if the balance of the poison remained after cooking.

Thrips.—Much damage is sometimes done to an onion crop by a fly of the order *Thysanoptera*, known as Thrips. These are very small insects, scarcely large enough to be seen by the naked eye. Like the aphides, scale insects, and plant bugs, they draw away the juices of the onion by means of their sucking apparatus. Dusting with lime or soot is said to be useful in destroying them, but deep ploughing appears to have the best effect.

Wire Worms.—No time must be lost in encountering this enemy. They require to be trapped in the following manner:—Cut up some carrots, beets, or sweet potatoes into wedge-shaped pieces, and stick them into the ground all over the beds to be protected. When these are taken up on the following day, it will be found that the worms have eaten their way into them. The traps should be lifted with a trowel, because many of the pests will be found in the soil around them. The only crop which the wire worm has an objection to is mustard; if, therefore, a crop of mustard be planted on land infested by the worm it will perish from starvation.

Scale Insects.—Resin compound is known to be very effective against scale insects. One of the best formulæ is—Caustic soda, 1 lb.; resin, 5 lb.; water, 25 gallons. Two ounces of Paris green may be added to this when used.

All insects, injurious or beneficial, have many natural enemies of their own to contend with. Amongst these, some which attack noxious insect pests from the outside, and either devour them or suck their vital juices, are called predaceous insects—*e.g.*, ladybirds, spiders, soldier bug, black ground beetle, &c. There are others which are called parasitic insects, which live inside the bodies of their victims, and ultimately kill them. Among these, the most numerous are the ichneumon wasps.

Birds.—There are some birds which are very destructive in the vegetable garden, but a much larger number are purely insect-eaters, and as such are of very great assistance to the gardener. I need here only instance the sparrow as an example of a seed-eater and a confirmed lover of young lettuce; and the dollar-bird as the friend of the gardener. Sparrows may be destroyed by poisoning them with wheat soaked in strychnine, vinegar, and sugar. A Belgian horticulturist claims to have discovered a sure and inexpensive way of preventing the depredations of seed-eating birds. It is to shake up some powdered minium with the seeds just before sowing. Red minium is a poisonous salt of lead, but is not dangerous to handle. Either its taste or smell prevents the seeds being touched by any insect or bird. Crystals of naphthaline are said to give equally good results.

Tomato Disease.—Tomato diseases have become very common of late years, and it, therefore, behoves every market gardener to be able to recognise the early symptoms of various troubles, so that remedies may be applied before the diseases have obtained a strong foothold. We will first consider the condition of the plant known as "Tomato Wilt."

This disease is a bacterial blight. The attacked plants wilt suddenly, and, after a time, leaves and stalks become discoloured and die. The disease is mostly spread by inoculation caused by the bites of insects. The organism causing the trouble is believed to be present in the soil, from which it spreads to the plants. Sour ground aggravates the evil.

The first step to take is to spray with a poisonous mixture and destroy those insects which move from plant to plant, thus spreading the disease. One ounce of Paris green in 10 gallons of Bordeaux mixture will effect this. Carefully dig round the diseased plants and prevent the spread of the web-like

fungus which extends its meshes from plant to plant underground, boring directly into the healthy cortical cell, and thus giving an entrance to the bacteria.

Root Knot.—This, as its name implies, is a disease of the root, caused by the eelworm, which forms galls or irregularly-swollen diseased growths on the roots, resulting in the wilting and death of the plants, which should be dug up and burned, and the soil sterilised with quicklime.

Tomato Blight.—In this case the fungus-infested foliage shows rusty, yellowish spots, and the edges of the leaves often curl downwards before the foliage shrivels and dies, leaving the stem bare. Spraying with Bordeaux mixture directly the first indications of disease are observed, and the removal of badly-affected plants, are effective remedial measures.

Tomato Rot.—This is caused by a fungus, which generally only attacks half-grown fruits, the first symptoms being the appearance of a small black spot at the blossom end, rapidly increasing in size until half the affected fruit is sunken, black, and destroyed, the injury usually extending uniformly from side to side across the tomato.

The crop also suffers from a kind of tomato dropsy, visible in swellings on both leaves and stems, and in the curling of the former. This disease results from an excessive quantity of water in the tissues of the plant, and is encouraged by insufficient light and by injudicious watering, especially in dull weather.

Bordeaux Mixture.—Sulphate of copper (bluestone), 4 lb.; quicklime (to be freely slaked), 4 lb.; water, 22 gallons. Dissolve the bluestone in 10 gallons of water by placing it in a sack suspended in the water and moving the sack about, when the sulphate will quickly dissolve. Make a whitewash with the lime, strain to separate the grit, and bring the milk of lime to 10 gallons. Mix these up to 22 gallons. Use only wooden or earthenware vessels. When the foliage is out, use the half-strength mixture by diluting in double the quantity of water. To determine if the mixture is safe to use on tender foliage, insert a new nail or the blade of a penknife for at least half a minute; if copper is deposited on the steel, lime must be added.

Celery Leaf Blight.—Spray at intervals of eight days, commencing when the foliage is quite young, with an ammoniacal solution of copper carbonate. This solution should be prepared by mixing 1 oz. of carbonate of copper with 5 oz. of carbonate of ammonia in about a quart of hot water. When thoroughly dissolved, 16 gallons of cold water should be added. If thoroughly done, two or three sprayings should suffice to suppress the disease. All diseased leaves should be burnt.

The Pumpkin Beetle (The Banded Galernca).—This is one that not only attacks the leaves of the pumpkin, but is also partial to the foliage and tender organs (especially the flowers) of vegetable marrows, cucumbers, and melons. It is an orange-coloured beetle, of an oblong form, measuring about a quarter of an inch in length, and rendered conspicuous by the presence of two black bands crossing the wing-covers, the posterior of which bands is interrupted in the middle. Although popularly styled a ladybird, it is not a member of that (the *Coccinellidæ*) family of beetles. It may, therefore, be most appropriately termed "The Banded Galernca," to distinguish it from the plain-coloured Galernca, a beetle of analogous habits, and having the same host-plants. [From notes on the beetle, kindly supplied to me by Mr. Hy. Tryon, Entomologist and Vegetable Pathologist, Department of Agriculture.]

Mr. Tryon suggests two methods of coping with the pest—"Repellents" and "Destroyers." The Banded Galernca, although endowed with a voracious appetite, usually declines to consume foliage which has become soiled. Accordingly, the plants may be more or less protected by dusting them all over with fine wood ashes and air-slaked lime or plaster of Paris, and especially if these substances have had a few drops of carbolic acid or kerosene previously added to them.

For destroying the insects, Paris green or London purple, in a dry state as diluted powder or as forming an ingredient in a liquid, may be dusted or sprayed over the plants.

When the plants are still very young, hand-picking may be resorted to with good effect, and subsequent soundness of the plants secured, as it is commonly those left to themselves that form a starting point for a second generation of insects of greatly augmented numerical strength, and thus give rise to the serious damage to the crop, and subsequent loss to the gardener, so commonly made a matter of complaint.

I may add that during October and November last I saved from fifty to sixty cucumber and vegetable marrow vines by hand-picking alone, and the fruit came to perfection. Over 100 of the beetles were caught every morning, and the same number in the evening, on each day during those months.

CONCLUSION.

Garden vegetables do not exhaust the soils on which they are grown to any extent as compared with the exhaustion produced by many field crops. Peas and beans are the most exhausting crops.

The chief ingredient in a good fertiliser for vegetables of which the leaves and stems are the edible portions is nitrogen. For root vegetables, phosphoric acid and potash are about as important as nitrogen. For vegetables of which the seed is the edible portion, especially such as are planted early, like the garden pea, phosphoric acid is the leading element. For vegetables like the tomato, egg plant, celery, melon, &c., potash is the most important.

Nitrogen forces early growth, and gives large, succulent leaves and stems. Potash gives solidity and crispness to stems and leaves, and high colour to the fruit. Phosphoric acid gives plumpness, and increases the sugar and starchy parts of the seed, and forces early maturity. A good general fertiliser for all garden vegetables, except beans and peas, would be the following mixture per acre, but intensive market gardeners use two or three times as much:—Sulphate of potash, 150 lb. to 225 lb.; superphosphate, 250 lb. to 375 lb.; nitrate of soda, 150 lb. to 225 lb. The fertiliser should be raked in just before the seed is sown. For peas and beans the normal amount of potash and phosphoric acid may be doubled, and the nitrate of soda reduced to 50 lb. per acre. The sulphate is the best available form of potash for garden vegetables, as it contains no chlorides of salt, and does not make the soil cold. It also acts with especial favourableness on the starchy portion of vegetables. Fresh or water-slaked lime is always beneficial to garden soil.

HOW TO TEST THE VITALITY OF GARDEN SEEDS.

The vitality of seeds diminishes rapidly with age, and it is, therefore, well to determine their vitality before sowing. A cheap and convenient way of doing so is the following:—Take two earthenware plates of the same size; cut out two circular layers of flannel, somewhat smaller than the plates. Between the two layers of flannel place 100 seeds of the variety to be tested. Moisten the flannel with all the water it will absorb. The two layers of flannel are placed in one plate and covered with the other, and set in a warm place. If the flannel is thin, several pieces should be used, in order to absorb sufficient water. Other kinds of absorbent cloth or blotting-paper can be used, but thick flannel is more satisfactory. Damp sand may also be used as a seed bed with success. The dishes should be kept in a room which is warm at night. Keep the flannel constantly moist. Some seeds will commence to germinate by the third day. Examine the seeds each day, and remove and record those which have germinated. Two weeks will suffice for the test. The results obtained may be considered as representing the per cent. of vitality under favourable conditions. The per cent. germinating in the ground is likely to be less. Grass seeds require as much as three weeks, and seeds of some trees a still longer time. Beet balls contain from three to seven seeds.

With very small seeds it may be necessary to provide for the circulation of the air by placing small pieces of wood between the layers of cloth among the seeds. With most varieties of garden plants the majority of seeds should germinate within a few days after the first sprout appears. If the period of germination extends over a longer period, it shows that the vitality of the seed is low. Seeds of the carrot family and some melon seeds may not show as high results in the germinating dishes as they do in the ground.

Below I give a list of common seeds, with the average number of years that they will retain their vitality:—Bean, 3; beet, 6; cabbage, 5; carrot, 5; celery, 8; cucumber, 10; maize, 2; lettuce, 5; rock melon, 5; onion, 2; parsnip, 2; pea, 2; pumpkin, 4; radish, 5; squash, 6; tomato, 4; turnip, 5; water melon, 6. [Taken from Professor Bailey's Horticulturists' Rule Book.]

This is what Weather's "Garden Plants" says about mulching, and vegetable growers, as well as horticulturists generally, will do well to "read, mark, learn, and inwardly digest" what is set down here. During all the dry weather which was experienced in Queensland from August to November, 1907, the writer of these notes grew excellent lettuce, French beans, tomatoes, and other vegetables, as well as dahlias, carnations, dianthus, and many garden flowers, mainly by the help of mulch. If you cannot thoroughly soak your land in a dry season, it is better to water very little and trust to mulch.

What is mulch?

A "mulch," or "mulching" in gardening language, means an extra covering of soil, rotten leaves, or manure, either separately or combined, placed over the roots of plants, either after the latter have been newly planted or at any period during their growth when it may be considered advisable.

The advantages of mulching may be summed up as follows:—

(*a*) During the hot and dry summer months it prevents excessive evaporation from the soil, and thus not only preserves the moisture for the roots to absorb, but it also prevents the soil from becoming excessively hot by day and cold by night, thus maintaining a more regular temperature.

(*b*) In winter it protects the roots from frost, and also keeps the soil warmer.

(*c*) When a rich mulch is applied to newly planted trees and shrubs, it not only has the above advantages, but the manurial matters contained in it are washed down into the soil, and enrich it with food for the benefit of the newly formed or forming roots.

(*d*) A good mulching of rich manure to all plants which have begun to develop fruit and seeds is highly beneficial in assisting them to swell rapidly and ripen more quickly. They make a demand upon reserve materials, and, if these are not quite sufficient to meet the demand, it is easy to conceive that the extra food supplied by means of a good mulching will supply the deficiency.

ROTATION.*

Plants belonging to the same natural order should not be allowed to succeed each other. Some crops are a good preparation for others, as, for instance, onions after celery.

Rotation assists in checking the devastations of insects and fungi to which a crop may be subject. Deep-rooted crops enrich the top soil for the benefit of shallow-rooted varieties which may follow.

Different crops require plant foods in varying proportions; hence a rotation is more economical of manure.

A definite system of rotation affords better opportunities for cleaning the ground.

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* For the above I am indebted to "The Horticultural Note Book," compiled by J. C. Newshan, F.R.H.S., head master and manager of the Hampshire County Council Agricultural and Horticultural School.

Crops which occupy the ground for several years should be succeeded by others of shorter duration.

Rotations allow of a better distribution of labour during the year. Plants cultivated for their roots or bulbs should not be succeeded by others grown for a like purpose.

Rotations may extend from three to eight years, according to the size of the garden, the quality of the soil, the products required, the manures available, &c.

EXAMPLES OF VEGETABLES WHICH MAY PRECEDE OR SUCCEED IN ROTATION.

Vegetable under Cultivation.	Preceding Crop.	Succeeding Crop.
Beans	Cabbages, brocoli, parsnips, carrots, potatoes	Cabbage tribe, leeks, turnips.
Beet	Cabbage tribe, leeks, onions, celery, potatoes	Cabbages, cauliflowers, peas, beans.
Borecole ...	Peas, beans, lettuce, potatoes	Carrots, beet, parsnips, onions, celery.
Brocoli ...	Peas, broad beans, kidney beans ...	Late sowings of carrots, turnips, &c.
Cabbages ...	Peas, beans, onions, potatoes	Celery, onions, beet, carrots, potatoes.
Carrots ...	Onions, cabbage, leeks, celery, potatoes	Cabbage, onions, peas, beans.
Celery	Potatoes, cabbage, any early crops ...	Peas, beans, onions, leeks, potatoes.
Leeks	Potatoes, cabbage, beans, peas ...	Peas, beans, carrots, parsnips, potatoes.
Onions ...	Potatoes, cabbage tribe, beans, peas, celery	Cabbage tribe, peas, beans, potatoes.
Potatoes ...	Cabbage tribe, beans, peas, onions, leeks	Peas, beans, cabbage tribe, celery,

Brussels sprouts require the same rotation as borecole.
Cauliflowers „ „ cabbages.
Kidney beans „ „ peas.
Parsnips „ „ carrots.
Peas „ „ beans.
Turnips „ „ carrots.

JOHNSTONE GRASS HAY.

Whilst admitting that Johnstone grass is an excellent fodder plant, we should advise and always have advised farmers not to have anything to do with it on cultivated land. It spreads rapidly, and is exceedingly difficult to eradicate. That view is shared by many Queensland farmers who have planted it. However, there are two sides to every question, and below we give the opinion of "The Florida Agriculturist," yet it will be noted that that journal remarks:—"The only objection to it has been that, once in the soil, it is almost impossible to get rid of it." If, says the "F.A.," you have some land which you are willing to devote to a permanent meadow, you might try Johnstone grass. The only objection to it has been that once in the soil it is almost impossible to get rid of it. It has proved to be very profitable as a grass for making hay, as is shown by the following from the "Rural New Yorker":—Johnstone grass is pretty well scattered over eastern Mississippi, and it is in most sections the main dependence for dry forage. It is a very nutritious grass, and is full of saccharine matter, hence stock are very fond of it, as they are of all plants containing sugary matter. It is more of a hay grass than pasture grass.

On some soils much pasturing will of itself exterminate it; this is true of sandy, light soils. On heavier and more waxy soils, the grass seemingly disappears after a certain period of pasture. The land may remain in pasture for years and not a sprig of the grass be discernable, but when the ground is ploughed and an effort made to grow a crop the grass springs up over the land and grows off luxuriantly. By planting the land immediately after the plough, working the crop rapidly and well, good corn crops are frequently made. Ploughing the land loosens up the under soil and breaks up the mass of cane-like roots of this grass, and the result is a luxuriant growth of grass and a

heavy yield of hay. In fact, ploughing the Johnstone grass meadow at least every two years is essential to secure maximum yields of this grass. On good lands, under fairly favourable conditions, three heavy crops of hay in one season is not unusual. On such land 3 and 4 tons of hay per acre is not above the average. The quality of the hay depends largely upon the stage of mowing; if the grass reaches too mature an age, you get more bulk, but at the sacrifice of quality. This is the case with nearly all hay grasses.

As soon as the hay is ready to bale, it can be readily sold at from 7 dollars to 10 dollars per ton f.o.b. Those who are not posted, or who are in need of money, usually sell in the fall and early winter. Those who know conditions better, and are not so pressed for money, hold the hay until spring, and get a much better price for it. The spring prices are always better. Last fall most of the hay crop in this part of the State was sold, and the price obtained was around 8 dollars per ton on cars. All who held on till winter was over received 14 dollars and 15 dollars. One man here, who works in a bank, who has a partner in the hay business, informed me the other day that they received a cheque for 230 dollars, the proceeds of one single car of hay. That sounds good for the hay business. He stated further that they sold a good deal of hay last fall at 8 dollars per ton, not any better quality than this last. Nearly all the hay that is raised in this section is from lands valued at from 5 dollars to 15 dollars per acre; lands that could not be sold for more money at this time. These lands under proper treatment have a productive capacity of from 3 to 4 tons of marketable hay per annum. Let us figure on 3 tons per acre at 8 dollars. Here we have a gross income of, say, 24 dollars per acre at the minimum price or 45 dollars at the maximum price. With the best of labour-saving hay tools and implements, supplemented with good management, there is certain to be good money in the hay business.

Johnstone grass is by far the most popular grass for hay with feeders throughout this and adjoining States. There is always a ready market for the hay at good prices. It will sell where Bermuda will not; it will sell where even alfalfa will not. Johnstone grass hay is well known; alfalfa is not. It has taken long years to introduce and build up a reputation for Johnstone grass hay. For a long time handlers of hay in our cities, and their patrons, were ignorant of the value of this grass as a hay, and were prejudiced against it. Horsemen would buy nothing but Northern Timothy. Not so now. The day was, and not very long ago, when buyers preferred the coarse, wiry prairie grass of the West to any distinctive Southern hay grass. Of course, that was ignorance, and gross ignorance. They had to be educated out of their ignorance and prejudices.

In connection with the above, the following from an Alabama paper shows how profitable Johnstone grass hay can be made:—

A man in Shelby county bought a little farm of 120 acres, which was a mat of Johnstone grass, not much fencing, some chimneys where the house had been, but fairly good outhouses. He got it for 450 dollars. That was a few years ago. The place is in good shape to-day, with a neat house and good fences, and not a dollar has been spent on it that was not made out of the place. The owner lives on it, and would not take 2,500 dollars for it. Much of the ready money comes from Johnstone grass and cattle. The man does not want a Government pamphlet telling him to kill Johnstone grass. It brings him 250 dollars to 350 dollars in cash every year.

SHEEP FOR THE FARM.

The following hints on selecting breeding ewes for the farm are given by an experienced New Zealand sheep farmer. He says:—"Not only does it pay to keep a few sheep to clean the land of weeds and vegetation that other stock do not eat, but they are directly profitable, inasmuch as the returns from wool

and lambs are no small item in the farm receipts. The mutton type of sheep, carrying a fair fleece of wool, is more profitable than the sheep producing wool chiefly and a carcass of relatively little value. The very best skill and experience are needed in selecting the breeding ewes. They had to deal with the relative merits of the different breeds or their crosses, their general hardiness, fertility, ability to nurse, early maturing, and fattening. The popular ewe in New Zealand is either the half-bred Leicester-merino or Lincoln-merino; either of these is prolific, a good mother, and gives a valuable fleece of wool. The cross-breeding gives vitality and hardiness to the ewe. Farmers who have merinos raise objections to the crossbreds. 'Fence creeping' is referred to, but as the farmers of late years have used wire netting very extensively and the ordinary sheep fences are much better and more substantial most of this trouble is avoided. Then the crossbred is preferable to the ordinary merino, as the latter part of the spring often sets in dry and the grass soon withers; consequently the value of the early maturing lambs, which are ready about a month sooner than the merino, cannot be over estimated. Further, the percentage of lambs from the crossbred ewes can easily be estimated at a considerable increase on the merino. Injury from grass and blindness with wool are less frequent, and the blow-fly is not so troublesome as on the merino ewes.

"Again, when it is advisable to feed down a cereal crop, the crossbred ewe will eat the rank growth more readily than the merino, which picks at the tender shoots and leaves the more forward plant alone. Equally as important, if not more so, is the selection of rams. One of the poorest places to economise is in the purchase of the sire, whether in cattle, horses, or sheep. The improvement of any flock from year to year is measured by the superiority of the rams. Many of the culled rams that are offered for public sale are not fit to be put with the ewes; thin necks, weak shoulders, and hollow britch are defects which will show in the progeny, and which must be avoided in the purchasing of rams. It will pay to purchase Lincoln or Leicester rams and mate them with their best plain-bodied, large-framed ewes. The ewe lambs of this cross should be kept to form the breeding flock for the export lambs, while the wethers make ideal mutton, and always command a good price in the market."

THE JACKSON POTATO DIGGER.

The following is the article referred to in our last issue concerning the new potato digger, manufactured and invented by Mr. Jackson, of Taringa:—"A few weeks ago the late Home Secretary, the Honourable F. D. Denham, and Major Boyd, of the Agricultural Department, journeyed, at the invitation of Mr. Jackson, of Taringa, to Kenmore to witness a trial of the potato digger lately invented and perfected by that gentleman. A large number of neighbouring farmers attended the trial, which was conducted on Mr. Squire's farm. The machine, which is simplicity itself, was drawn by two horses. After a preliminary trial to regulate the depth of the coulter, Mr. Burnett set it to work in earnest, and it performed the work to the satisfaction of all the practical farmers present. The rows were two and a quarter chains long, and the average time taken to turn out every potato in the row was one minute. As soon as the machine was set to the proper depth, every potato was unearthed, and busy forks failed to find any left in the ground. At the conclusion of the trial, Mr. Denham mounted the machine, and turned up a row in good workmanlike style. Mr. Denham's row was turned out in just half a minute, and a sack of potatoes was the result.

We omit the last paragraph of the article for obvious reasons. Mr. Denham was at that time canvassing the Oxley electorate.

Dairying.

DAIRYING INDUSTRY.

COMPREHENSIVE REPORT—*continued.*

By G. SUTHERLAND THOMSON, Government Dairy Expert.

OBJECTIONS TO GRADING CRITICISED.

Exception has been taken to the grading of butter in Queensland, particularly the marking of grades on the boxes. With a view to a modification of the Dairy Act in its application to grading and inspection of cream, pressure was brought to bear on the Department by representatives of proprietory and co-operative companies.

The chief reasons that members of recent deputations against grading used in support of their demands were as follows:—(*a*) Butter improves in cool storage; (*b*) it is impossible to tell in Brisbane what the quality of butter will be when it reaches London; (*c*) butter that was stamped No. 1 has turned out in London a No. 2, and *vice versâ;* (*d*) climatic conditions differing in the State and different food for milking stock ruin all possibilities of grading accurately; (*e*) London merchants purchase Queensland butter under the trier and not according to official grade; (*f*) the superfine stamp is not a guide to the quality of butter; (*g*) prices of second-grade butter are frequently only a little lower than first grade; (*h*) a Brisbane firm lost hundreds of pounds last year owing to grading; (*i*) grade is no assistance to the sale of butter.

LONDON'S POINT OF VIEW.

Before dealing with the above, let me point out that the anti-graders in Queensland have had no experience of the London butter trade; and, consequently, are at the mercy of reports, which, though given in all good faith, may be misinterpreted by mistaken ideas and feelings of prejudice against any good which grading may do for the industry. Had the Queensland objectors examined the produce of the State as it opened out in London last season, sufficient evidence would have been available of the shortcomings of manufacturers and exporters to have warned them of the very great danger the industry was exposed to had grading not come to the rescue of the producer. This I shall attempt to prove; meanwhile let me reply to the reasons offered by deputations against the system.

(A)—IN COOL STORAGE.

It is an established fact amongst trained judges of dairy produce and authorities in the science and practice of dairying that butter manufactured from carefully ripened cream will retain its fine flavour, and maintain its keeping properties when properly stored for a period exceeding the return journey from Brisbane to London. An improvement in flavour may be observed in butter after a period of storage at a temperature sufficient to preserve its good qualities, provided the butter was graded a day or two after manufacture, when the true flavour had not properly developed, to become fixed in the butter.

My researches into this subject, which date back a number of years, demonstrate that butter affected with weedy (not stale) flavours improves when kept at certain temperatures, and this has been used as an argument against Government grading; but as the question is of a deep scientific character, although of practical significance, I do not consider it necessary to dwell upon it here. At the same time, I wish to point out that the proportion of weedy

butter in a season's export is small, and as a result of the flavour weakening in cool storage every consideration is given to this in the classification of the butter.

(B)—WHEN IT REACHES LONDON.

That is quite so, if the temperature of the produce is not low enough to stop fermentation, and had it not been for the attitude of the Department of Agriculture two years ago, when the Department's demand for lower temperatures in the storage of butter grieved manufacturers, there would have been cause for complaint in this direction. When this was a burning question, I stated at a deputation which waited on the then Minister for Agriculture (Hon. D. F. Denham) that 20 degrees Fahr. was necessary for the oversea carriage of good butter, but a second grade would require at least a temperature of 10 degrees Fahr. to prevent it from deteriorating into a third grade. This question will be fully dealt with in the April Journal, and I would advise readers to study it carefully.

(C)—CHANGES EN ROUTE.

For a further answer to this conundrum I would refer the producer to the criticism of mixed brands of butter which is given in this report; but the chief fault I found in Queensland grading was the kind consideration the graders showed manufacturers in classing the butter, which amounted to leniency.

(D)—DIFFICULTIES OF GRADING.

Climatic conditions and food are factors of some importance, and this might have called for consideration a few years ago when grading was first considered. Now it has been shown not to interfere with the principle of grading and the marking of boxes.

(E)—HOW BUTTER IS PURCHASED.

Yes, in the case of some brands from Queensland, the London buyer has found it absolutely necessary to treat every box under the "iron" as the indiscriminate mixing of the brands, and otherwise careless handling by manufacturers has demanded the exercise of this precaution in the purchase of the butter. Likewise have London merchants deemed it imperative to weigh every box of butter from some Queensland factories, with the result that the producer of Queensland has suffered.

(F)—STAMP NOT A GUIDE.

That is why Queensland has not been reckless in applying the superfine stamp. But for what reason is this being used as an argument against grading, when so much was previously said in support of the stamp? It seems to me that objectors to grading find their views do not coincide, and that it is becoming difficult to propound new "theories."

(G)—VERY LITTLE LOWER.

Get the confidence of the British trade in the reliability of factory grades and the difference will be more marked, excepting when the demand for seconds is in excess of the supply, perhaps through market conditions, which are thoroughly known to anti-graders as a cause of prices being inconsistent with the quality of the butter, but I shall deal with this matter fully in another issue of the Journal.

(H)—NO EVIDENCE AS TO LOSSES.

No evidence was forthcoming to show that a Brisbane firm had lost hundreds of pounds through imperfect grading. I know that thousands of pounds have been realised by Australian manufacturers through "first class" factory brands, which contained second-grade butter, being accidentally stamped with the first grade mark. When export butter is not bought on consignment, what has the shipper to say against grading?

(I)—GRADE NO ASSISTANCE.

That grading is of no assistance to the selling price of butter has been dispensed with, and I might add that when grading was introduced it appeared to have staunch support from some of those who now are discrediting the work of the graders. This I attribute to a thoroughness in the system of grading, and the object for which it was enforced being more fully realised.

AN AUTHORITATIVE REPORT.

Since the preparation of these answers to aggrieved members of the industry, a valuable contribution on grading has appeared in Messrs. Weddel and Co.'s review of the produce trade for the past season, and in which a tribute is paid to compulsory grading as carried out in Queensland. The proprietors of this review are well known throughout the agricultural world, and their opinions are of more than passing interest to readers, and producers in particular.

GOOD BUTTER NOT DUE TO FACTORY MACHINERY.

It has been asserted by a prominent Queensland authority on dairying in his monthly "Gazette" that the good quality of butter from Queensland was chiefly obtained through the introduction of modern machinery into factories, and not in any way to grading. This, no doubt, assisted in improving the butter, but an important factor was the greater care shown by the farmer in the treatment of his cream, and he is to be complimented in the advance he has made in the face of hurtful agencies accruing from suicidal competition for his supplies. Were the power of the steam engine the cause of the improvement, there would be no need to enforce the provisions of the Dairy Act, as the flavour of inferior cream would be corrected within the four walls of the factory and without the aid of trained butter-makers.

PRIZE SHOW BUTTER.

The classing of cream and attending to matters which are given in this report as essential to the uniformity in the quality of butter was fully borne out in the success of Queensland factories at London, and this is accepted by some leading judges of produce as a substantial argument against Government grading. It certainly serves to illustrate what the State is capable of doing in the production of a choice article, and I have repeatedly stated in public and in the Press that Queensland is in a position to put on the market butter of a quality equal to the finest exported. But why should so much capital be made out of the victories of the show stand, when it is known that competitive produce is made for one purpose only—to win a prize? To obtain this distinction, which is certainly creditable to manufacturers, every possible care is taken in the selection of the cream, and strict attention is given to all that pertains to the making of a fine product.

What, in my opinion, is chiefly desired by our factories is to carry the New Zealand and Danish practice into operation each day, and manufacture butter that will take a prize in the open market every time the brand is offered for sale; that prize to be pounds, shillings, and pence, to which is added the confidence of the buyer in the even quality of his purchases.

The awarding of trophies by agricultural associations for butter exhibits wants remodelling. Surprise examinations of factory butter should be made from time to time throughout the season, and without the knowledge of the factory. To do this effectively, no difficulty would be met with, as the export produce of the factories of the State may be sampled in Brisbane under the most favourable conditions for careful judging.

POOR QUALITY BUTTER.

In contrast with first-prize produce much of the butter arriving in London last season might have been equal in quality to the finest in the London

market had not the intense competition amongst proprietory and co-operative factories been responsible for the purchase of low-grade cream at the same price as the choicest quality, and which figure was, and still is in some instances, equivalent to the market value of first-class butter. This ruinous and abusive practice was intensified during last export season by an exorbitant price being given to the leading proprietory factories for the whole output of butter for the shipping months of the year on a stipulation that the butter passed the Government examination as first class. Doubtless the factories enjoying this privilege, and in particular the less fortunate ones, found very great difficulty in paying the high price for cream against the inferior and mixed quality of the butter manufactured; but the Department was not partial to the factories in the bitter struggle for the cream supply when examining the exports, and efforts were made to treat the produce as its quality demanded, and perhaps this is one of the reasons that the grading is characterised as unduly severe.

OPINION OF AN ENGLISH AUTHORITY.

The following is an extract from a letter the writer recently received some months ago from one of the most prominent of London produce authorities, and whose opinions on export dairying matters generally are accepted throughout with the highest respect and the greatest consideration:—"I see nothing to stop Queensland butter from occupying a high place in this market, and the quickest way to success, in my opinion, is to let people in this country know that you are throwing out all the 'doubtfuls' and branding them according to their deserts. In this way buyers will have a considerable amount of confidence in buying first-grade Queensland butter, as they know they will get an article that will come up to its right standard."

SEVERITY IN GRADING.

One hears daily that the grading in Queensland is far too severe, and, when this is inquired into of the complainants, no other reason can be given than that they differ from the judgment of the grader in marking boxes of their butter second or third class, when, in their opinion, it should receive a higher mark. This is a very weak and childish argument, and it is not to be expected that any other would be given, as there is strong evidence to show that the thoughtless layman is only voicing the opinion of the bombastic exporter, whose heartfelt desire is to see his produce marked superfine or first-class, without any careful examination of its quality. I have no hesitation in saying that the anti-grader in Queensland has inflicted injury on the industry, and the producer should not fail to see it, as when a determined attitude is taken up against careful grading no encouragement is given to correct errors in the handling of cream and manufacture of butter, and it is also adding to the wrongs and misgivings of the trade, which past experience has shown to have been costly to the farmer and the State. Those in responsible positions in the industry should assist the producer and factory to right what is wrong by a more manly and nobler way, and if this were the earnest desire they would then be trying to do what the Australian grader has done—his duty.

A VISIT TO THE ROMA-STREET COOL STORES, BRISBANE.

(By a Representative of the "Daily Mail.")

A visit of inspection to the Government cool stores in Roma street when the butter-grading operations are in progress, will undoubtedly convince anyone interested in the trade that the supervision and inspection by Government officials of all butter, whether for export or local consumption, is a matter of absolute necessity. Not only is the inspection necessary for the purpose of ascertaining the quality of the butter, but also to see that the boxes contain the correct weight.

SHORT-WEIGHT BUTTER.

The Federal Commerce Act contains stringent regulations regarding the weight of produce for export. For instance, if a box of butter marked 56 lb. is found to contain only 55½ lb., the representative of the factory or the person who made the butter is not allowed to alter the marks. The Queensland Agricultural Department has up to the present acted very leniently towards the producers in this respect, and the Government grader has marked the correct weights on the package. This, however, is not to be allowed in the future, and the Customs Department has had instructions to see that the Commerce Act in respect of weights is complied with.

Recently a small consignment from a well-known factory arrived at the cool stores, and four boxes were weighed. The weights were as follows:—51 lb., 51½ lb., 52 lb., 52 lb. Occasionally the boxes do not contain 50 lb., and recently one box was found to contain only 49 lb. 2 oz.

GROSS CARELESSNESS.

The authorities do not suggest that the producers are sending short weight with fraudulent intention, but rather that the errors are due to gross carelessness on the part of their employees. No system has apparently been adopted with regard to weighing the produce at the factories, and the only way to ensure correct weights is for the offenders to be prosecuted, and that procedure is to be adopted in the future. It is agreed that sufficient warning has been given, and no more leniency will be shown.

BUTTER-GRADING.

Mr. Thomson, the Queensland Government Dairy Expert, in a recent report, said that there is little to be desired in the colour or finish of the Queensland product, but the same cannot be said of its flavour and texture. The value of classifying butter is based on the ability of the grader to determine the keeping properties, and that stamps it with the grade indicative of the quality of the butter when opened up in the warehouse of the London merchant in Tooley street. For example, if the flavour showed a trace of stale cream the grader would be seriously at fault if he stamped the butter as first-class. On the other hand, the butter might not possess a disagreeable flavour, but its carrying properties would not entitle a first-grade stamp, as would be shown by the inferior character of the texture. The grader has to consider all the conditions which precede bad flavours—the age of the produce at the time of grading, the temperature at which it is to be stored, and the period of storage. It will be acknowledged by even those who are opposed to grading that, if the butter in the cool stores showed signs of deterioration on arrival, when it arrived in London it would not have improved in quality, but rather to have further deteriorated.

SYSTEM ADOPTED.

The many complaints that from time to time had been received from the butter merchants at home seriously influenced the export trade, and the Agricultural Departments in the different States stirred themselves in the direction of butter-grading and inspection under Government supervision. In Queensland, the officers of the Agricultural Department take the flavour and texture of the butter as the questions of primary importance, colour, packing, &c., being of secondary consideration, although these factors are by no means neglected.

ROMA-STREET COOL STORES.

At the Roma-street Cool Stores during the busy season 2,500 boxes, or 62½ tons of butter, are received weekly, and it is impossible to expect that the staff engaged would be able to examine each box. The grader works on the average system. A number of boxes are picked out indiscriminately from a consignment, the lids of the selected packages are removed, and the grader,

generally Mr. Winks, the chief grader of the Department, inserts the "trier" into the butter and takes a sample. He smells it, and, if it is not too rank, he tastes it. So keen does the palate become with practice that the grader is able to detect the slightest taint. Perhaps the flavour of the produce is very pronounced, and if that is so it is classified as a third grade; if it is slightly off, it is classified as second grade. Great care is taken with regard to the first-class butter. The expert realises that the progress of a butter factory, or the increase of its export trade, is dependent on his judgment, hence his caution. At different periods samples of butter are taken from the different consignments and forwarded to the Agricultural Analytical Chemist. He ascertains the amount of water, fat, casein, and preservatives contained in it, and the butter factories are supplied with a copy of the analysis.

DATE OF CHURNING.

The regulations under the Queensland Dairy Act provide that the butter factory or producer must place the date of the churning on the outside of the box. In some instances this is not complied with, and in other cases the factories use pencil instead of a rubber stamp as required by the Act. This negligence greatly inconveniences the grader, as he has to minutely inspect the box to see the date, whereas if a distinct stamp were used there would be no difficulty in ascertaining at a glance the date of manufacture. Some of the up-to-date factories, in addition to the date, place the number of the churning on the box; and this assists the grader, inasmuch as if a number of boxes bearing the same number are found to contain a first-grade article, then the rest of the same churning is classified accordingly. If all producers would adopt this system, it would relieve the Government officials of a lot of labour.

MIXED BRANDS.

Many of the butter factories, it is to be regretted, adopt the system of bluffing—that is, they mix butter. In boxes with the brand denoting the first-grade butter of the factory are to be found from three to four distinct classes. For instance, yesterday morning ten boxes of butter, part of a consignment from a well-known factory, were tested at Roma street. They were all branded and dated alike, and the first box opened contained first-class butter, the next was rank, and the third contained an overplus of salt, and the fourth was "off." The remaining boxes were also of poor quality, and the whole consignment was consequently marked as second grade. Among this consignment there may have been several boxes of good quality, but, owing to the carelessness of the grader at the factory in not separating the butter, the whole consignment was placed in the second class, and the factory has accordingly suffered. The graders state that this sort of thing is of frequent occurrence.

Opponents to compulsory grading argue that cases often happen that butter graded as second class in Queensland fetches the first-class price in the London market, but that can be explained by the fact that the buyer at that market has had the bad luck to select for trial one of the good boxes that had been mixed in with the consignment. The producer accordingly reaps a better price; but in the long run he suffers under the old adage, "Once bit, twice shy." The buyer next time remembers that he has been had, and refuses to bid for the butter under that brand.

PROPORTION OF WATER.

Now that the Butter Bill has become law in England, precautions are to be taken by the British authorities to see that the proportions of water, fat, casein, and preservatives in butter shall not exceed a certain standard. Recent examinations of Queensland export butter have shown that the proportion of water has exceeded 20 per cent. The Federal Commerce Act, the Queensland

Act, and the British Butter Act have fixed 16 per cent. as the maximum amount of water allowable, so it will easily be seen that cause for complaint is found also in this direction.

It is these sorts of complaints that the Government desire to prevent, and the Agricultural Department, in the interest of the producer and the industry generally, is taking every precaution to stop the abuses of the export trade. It is stated that, amongst the worst offenders in Queensland with regard to short weight, water in the butter, and brands of mixed qualities, are some of the greatest opponents to the system of Government grading. The Agricultural Department is only too willing to allow factory managers and others to be present while the grading is taking place. As a matter of fact, the town representatives of the factories do attend and see that the weights are correct. If the factory managers would arrange for a visit of inspection to the cool stores, so that they could see the manner in which the butter was classified, it would undoubtedly be to their advantage. It would also tend to remove from their minds the mistaken idea that the officers of the Agricultural Department are their enemies.

COMPULSORY GRADING OF CREAM.

Mr. Thomson, in an interview, mentioned that if a compulsory grading of cream was insisted on the butter trade would benefit. He referred to the commendable example of the Millhill Company, at Warwick. That factory has decided to grade all the cream that is brought to the factory, and to pay according to its quality and freshness. If other factories would adopt this system it would be to their advantage, as the farmers would be encouraged to bring the cream along when it is fresh. At present no distinction in price is made between stale and fresh cream—"Daily Mail."

GRADING AND PRICES.

One of the most cherished bits of "evidence" in the breast of the anti-grader against the official inspection of produce are the prices obtained for butter which has been exported to London under the Government stamp—first, second, or third, as the case may be. It may follow, and has followed, that the difference in money obtained for second and third grade butter has amounted to as little as 1s. per cwt., in other instances the price has been the same, and it has occurred that third-rate butter has realised as much and even more than the second grade. Let me explain how this may happen, beginning with the influence of market. As every person associated with the distribution of dairy produce in Great Britain knows, there are periods when the demand for inferior grades of butter and cheese exceeds the supply, and this condition of the market may force the price of the produce to a figure equivalent to the selling price of superior grades. At such a period, and it not infrequently happens, a third-rate butter may bring, say, 104s. or more, but upon the arrival of fresh shipments of produce and a change in the market the low grades are thrown to one side, and the superior supplies of butter are sought after at prices corresponding to their true values. Instances of the above have come before my notice on several occasions, and I was aware that prices paid for inferior grades of Queensland butter have been absurdly high, and that the information would prove hurtful in the minds of the unscrupulous anti-graders; and, as already pointed out, not one of this class of men in Queensland has had an hour's experience of the British markets, but he does not wish to give producers the truth regarding these sales; on the contrary, misrepresents everything; and some anti-graders are known to me to have deliberately and persistently lied to gain a point against compulsory inspection of produce. How frequently has the man in search of truth relative to the prices of Queensland grades of butter been comfortably housed in a business office in Brisbane and asked to accept the anti-grader's dictum from his long list of figures proving the vagaries of the

world's markets? How many inquiring visitors have been converted against the truth through the persuasive powers of the anti-graders whom I have shown to be retarding the progress of the industry? It is the producer who has been wronged, not the butter graders of Queensland, as I shall conclusively prove before I conclude this report.

Next we come to another condition existing in the markets of Britain, which may very considerably influence the prices of low-grade produce. It follows that the market is frequently glutted with inferior butters. These are held back till an opportune period, when everything is done to obtain the highest rates for the produce; and in the distribution of this butter so great may the rivalry be amongst merchants to do their Australian patrons the fullest justice that boxes of very poor butter may pass into the hands of the retailer at prices beyond the value of the produce. All this is cabled to the Brisbane broker, commission agent, or factory, as the case may be, as I have already pointed out, and, be he an anti-grader, he greedily seizes the opportunity to mislead the people and slander the work of the official inspectors of the Department of Agriculture.

To illustrate what I have said regarding fictitious quotations for butter, readers might note the phenomenal prices paid in London for Cheddar cheese during the months of April, May, and June of 1907. At my instigation, Queensland forwarded a considerable quantity of cheese to the market during the latter two months, and secured as much as 60s. per cwt. for brands which would not have brought more than 40s. under ordinary market conditions. The finest cheese from the State arriving at the same period, which in flavour and texture was far superior to the 60s. quality, realised only a few shillings more.

Famine Rates.

We have still another example of what the anti-grader would term a true analysis of the value of butter inspection. As I write, dairy farmers have a splendid opportunity of realising the effects of a phenomenally strong market in the disposal of all grades of butter. Pastry butter and second and third grades will be disposed of at prices a little lower than choice brands, and this will show where an argument against grading meets with absolute disaster. In past seasons many instances could be quoted of the market jumping through what one might call temporary starvation, and cablegrams have been received in Brisbane showing that second grades have accordingly brought the same price as first; but, as a rule, when this is announced, no mention is made by the shipper whether it was a high second (87-89) or a low second (83-85) which obtained the premium. In the case of extreme market conditions, however, distinctions in awards for points are not always considered, for reasons which need no explanation to the intelligent reader. But the stamping of the boxes stands out pronouncedly as a protection against serious dangers which accrue to the distribution of a country's export at famine rates; and Queensland will add much to her credit in Great Britain through the strict grading and marking of boxes now and at all times.

To account for these erratic prices we have another cause which the factory is responsible for, and which the anti-grader would appear to have deliberately encouraged in every butter-making establishment in Queensland—namely, the putting up of boxes of different grades of butter under a factory's choicest brand. And so ruinous was the practice to the reputation of the industry and the producer in particular that stringent measures had to be taken by me to stop it. The grading officers were, therefore, instructed to stamp all brands of butter which contained different grades with the official mark indicative of the average quality of the produce, and where a factory persisted in the mixing of their choicest brands, by throwing in third grades and boxes of pastry butter, the third-class stamp of the Government was to be used to an extent demanded by the seriousness of the offence. So glaring were instances of this

sort in the London market that I had a letter forwarded from the Agent-General's office to the merchants of Tooley street, which reads as follows:—

[COPY OF LETTER.]

"Queensland Government Offices,
"1 Victoria street, London, S.W.,
"15th April, 1907.

"SIRS,—I have the honour to report that instances of factories mixing boxes of first and third class butter under the factories' choicest brand has come under my personal notice during recent inspections of dairy produce at Tooley street. In each case, the graders' examination was thorough, but to the casual observer it would appear that the Queensland Government officers had erred, as boxes of first-class butter bore the 'third-class' mark of the Government, a course following the stamping of the boxes according to the average quality of the butter found in the brand inspected by the officers at Brisbane.

"This alone should suffice to show the value of Government inspection of butter as a protection to the buyer against errors on the part of manufacturers. I would, therefore, suggest that the buyers of Queensland butter should assist the Government through their agents in Queensland by bringing under the notice of factories the necessity for stringent care in the direction stated.

"I have the honour to be,
"Sirs,
"Your obedient servant,
"G. S. THOMSON, Dairy Expert for Queensland.

"Messrs. ————,
"Produce merchants, Tooley street."

Seldom a week would pass without my report to Brisbane disclosing serious faults in the classing of the butter at factories, and although the mistakes were brought prominently before those responsible for the progress of the factories little or nothing was done to remedy the evils until my return from London, when the inspection of Queensland butters was made more stringent. The following are extracts from my London reports:—

"My experience in London has demonstrated to me that damage has been inflicted on the name of Queensland as a butter-producing country by the action of manufacturers in shipping third-grade butter in boxes bearing the same brand as that indicative of the choicest product, and by mixing first, second, and third grades in parcels similarly branded. It has been fully borne out that the consideration shown manufacturers by the grading officers has been taken advantage of to an extent that nothing short of the most drastic measures are necessary to remedy evils which are costing the industry thousands of pounds in reduced prices. I have seen sufficient of our manufacturers' mistakes to warrant fresh regulations to safeguard the producer from further injury in the British butter markets."

Extract from a letter dated 21st February:—

"This butter has been sold as the choicest grade, each box bearing the best brand of the factory. It was again sold by the Tooley-street buyer on the strength of the factory classification, but after delivery the butter was found to be made up of different grades, and accordingly the parcel was returned to Tooley street as not up to the guarantee given by the factory. From my examination of this butter I have no hesitation in saying that the factory brand was misleading, not only to the agent in Queensland and the buyer here, but to the Government of Queensland, who grade the butter.

"This factory is inflicting great injury on the reputation of its butter. Inferior produce should not be shipped under a brand that is likely to be taken to represent a choice grade of butter.

"The factory should be advised to exercise more care in classing the cream. It is evident from the mixed condition of the butter that buyers will not put confidence in the brand.

"Three boxes of this brand were examined; one box showed the mark of the grader's iron, and was marked 'Tested.' It was third grade in quality, as specified by the grader. The other boxes were found to be of first-grade quality."

Many contributions in the Australian Press have dealt severely with factories for mixing grades of butter, and it has been proven that the claims of the anti-grader against the examination of exports by virtue of high prices being obtained for low-grade produce are, as already stated, absolutely absurd. Here I shall give copies of correspondence which deal more effectively with the subject referred to.

A quantity of butter stamped with the factory's choicest brand was found to be mixed in quality, and immediately the matter was reported to the factory, which brought the following reply from the manager:—

"The ———— Dairy Company,
"29th October, 1907.

"The Under Secretary, Department of Agriculture, Brisbane.

"Sir,—I have the honour to acknowledge your letter of the 26th instant.

"This factory has always been careful in not mixing grades and only putting one quality up under any one brand, and, with all respect to the opinion of your graders, I am quite positive the consignment in question was not mixed in quality.

"I consider this factory has been very harshly treated in this connection, and we have lost all faith in the grading system.

"We have had numerous instances of butter having been graded second and third by your Department, graded by competent men in Brisbane, and they have repeatedly given it as their opinion that the butter was of first-class quality. These facts speaks for themselves, and we are of opinion that the present grading system is, to a great extent, detrimental to our interests as butter producers.

"I have the honour to be,
"Sir,
"Your obedient servant,
"————, Manager."

A request as follows was sent to the Agent-General for Queensland to have the butter examined:—

"25th October, 1907.

"Sir,—I have the honour to inform you that ————, grading inspector under the Dairy Produce Acts, reports that when examining a consignment of ———— boxes of ———— butter on the 16th instant from the ———— factory, the quality of the butter in the different boxes was found to vary considerably.

"Owing to the irregular quality of this butter, which was shipped to England by the ————, it is asked that on arrival in London it may be re-examined, and any information deemed advisable given to the purchaser. The boxes are legibly stamped '12 Oct.,' in figures and letters ¾-inch long, on the same side as the Government grade stamp. It is desired that special attention may be given to the boxes marked 'Tested.'

"I have the honour to be,
"Sir,
"Your obedient servant,
————, Under Secretary.

"The Secretary to the Agent-General for Queensland,
"1 Victoria street,
"London, S.W."

The Agent-General furnishes the Department with the examiner's report:—

"London, S.W.
"19th December, 1907.

"SIR,—I beg to inform you that I have this day examined a shipment of ——— boxes marked ———, stamped '12 Oct.," and third grade, per ss. ———.

"Ten boxes were opened, five marked 'Tested' and five without. The quality of both lots varied very considerably—of the five 'Tested' boxes, two were bad, both as regards flavour and aroma—these were graded true; the other three were very much better, and quite entitled to a second-grade stamp.

"Regarding the five boxes without the word 'Tested'—one box was 'rank,' three boxes were good, and equal to second-grade butters, while the fifth box was a real good box of butter and quite equal to first-grade ——— butter by the same steamer.

"Through the mixing of this consignment the factory must have lost a very considerable sum of money, as the bad classing caused a probable loss on two-thirds of this shipment of from 2s. to 4s. per cwt.

"I am,
"Sir,
"Your obedient servant,
"———.

"The Acting Secretary,
"Agent-General for Queensland,
"1 Victoria street,
"London, S.W."

Before leaving London I submitted a short report to the Agent-General on my inquiries into the Queensland dairy produce trade, a copy of which I now give:—

"Queensland Government Offices,
"1 Victoria street, London, S.W.,
"24th June, 1907.

"SIR,—I have the honour to report on the ——— shipment of ——— boxes from Queensland, and to draw your attention to an improvement in the general quality of the produce. It is also desirable to again bring under your notice errors in manufacture which are seriously militating against the progress of the industry—namely, the uneven classification of cream at the factories, and the indiscriminate mixing of boxes of first, second, and third grades of butter. Repeated mistakes of this kind have occurred during the season, consequently buyers have not the same confidence in factory brands, and I might add that the grading of butter by the Government, although most valuable in checking this weakness, has, through the fault of Queensland factories, been robbed of much of its worth to the State. Had I not been a close observer of the condition of shipments of our butter upon arrival in Tooley street, I should have criticised any unfavourable comment on the ability of Queensland factories to place on the British market produce true to the descriptive brands. These remarks may appear on the side of severity, and some people may say they are quite uncalled for, but such is far from being the case. To overlook what I have complained of, and which I believe to be Queensland's greatest defect in building up a sound export trade, would be an oversight on my part, more especially when I have been confronted from day to day with its disastrous effects on the success of the industry and the reputation of the butter factories of the State. But apart from this Queensland has accomplished a good deal to merit the attention of British buyers of dairy produce, and very striking illustrations have been afforded me in support of the State as a producer of butter of the choicest quality. It is also admitted by the London produce trade

that Queensland has a great future as a contributor to the butter market of Britain, and all agree that with strict attention to the handling and grading of cream the State will have little to fear in competition with other countries.

"In pursuing a policy of speedy improvement of the industry, the requirements of the world's markets should not be lost sight of, and I have good reason to think that Queensland has erred in opening up an export trade with London and other produce centres in Britain before acquiring a knowledge of the demands of the buyer and consumer, and which has reacted against the disposal of the butter at high market rates. Such information can best be obtained in the distributing centres, and I am of the opinion that thousands of pounds would have been saved to the dairy farmers and produce merchants and exporters of Queensland butter had this not been overlooked. And I must confess that the knowledge the State possesses with regard to the defects in Queensland produce, noticeable only on the floor of London warehouses, is exceedingly meagre, and, from experience gained in Tooley street during the past six months, I can only say our manufacturers and exporters have a great deal to learn in the production and export of butter and cheese. Much, however, of what has been observed by me as important to Queensland has already been made known to supporters of the dairying industry, as a previous visit to Tooley street convinced the writer of the importance of a close study of the markets here. The Department of Agriculture in Brisbane has been assiduous in drawing the attention of the State to recommendations accruing from this source, and which, unfortunately, have not received the consideration they merited. It is with some degree of satisfaction that I draw your attention to the following regulations which were suggested to the industry, and have now been confirmed as necessary adjuncts to founding dairy farming in Queensland on sound progressive lines:—

A.—Compulsory grading of cream.

B.—Compulsory payment of cream on the basis of flavour as well as fat percentage.

C.—Compulsory examination of managers for certificates of proficiency in the grading of cream.

D.—Compulsory aëration of milk.

E.—Compulsory carriage of milk and whey in separate vessels.

F.—Cessation of the practice of pooling cream.

G.—Compulsory stamping of the date of manufacture and churning number on each box of butter.

"These recommendations were all opposed by the industry, the chief objections coming from the factories, and, until they accede to the wishes of the Department of Agriculture as specified above, a much desired improvement in the butter trade of the State will not be forthcoming."

FACTORY INSTRUCTION SUGGESTED.

Those opposed to the inspection of butter, as already remarked, have wronged the grading officers, and they have demanded a change in the system of inspection and factory instruction. But all the instructions in the world would have been useless against the forces which appeared to be working towards the destruction of the vital clauses in the Dairy Produce Act of Queensland, and the course adopted, which is reiterated here, to produce honest brands of butter for export to oversea markets has been a victory for the producer, who, unfortunately, knows not the bad practices of the trade and the wickedness of the anti-grader in whom he puts his trust. The door is now open for the appointment of an instructor to work in conjunction with the grading officers of the Department, and should the Government take this step I feel certain it will be followed with very satisfactory results.

"A PUBLICATION."

The contributions on grading appearing in a Brisbane monthly "paper" have, in the opinion of the writer, been published without due consideration or

even a passing study of the true requirements of the export trade and particularly the Queensland dairy farmer. The "paper" has been almost desperate in its attempts to crush the official inspection of dairy exports, and in its impotent threats and assertions has stated that the efforts of the Department are playing into the hands of the exporter. In the face of what has already appeared in the "Departmental Journal," the dairy farmer of Queensland should quickly decide whether the writer in the "paper," be he editor or owner, or myself has the true interests of the producer most at heart. For the result of an experiment which may particularly interest the "paper" as well as the producers of Queensland, I would refer them to the next issue of the Journal.

DAIRY AND COMMERCE ACTS.

The supervision of dairy exports, which has been in force in Queensland since the passing of the Dairy Produce Act in 1905, has been of unquestionable help to the industry. The Commonwealth Commerce Act has since been introduced, and the value of the measure to Australian dairying is being duly demonstrated. The Commerce Act will be of much greater help when the grading of butter and cheese is made compulsory throughout Australia.

[TO BE CONTINUED.]

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 31ST JANUARY, 1908.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Beauty ...	Ayrshire ...	Dec., 1907	851	4·2	40·03	
Careless ...	Jersey	20 Oct. ,,	693	5·2	40·36	
Chocolate ...	Shorthorn ...	5 Mar. ,,	575	5·8	37·35	
No. 112 ...	Jersey Grade ...	Sept. ,,	676	5·0	37·85	
Cocoa ...	Jersey	Dec. ,,	815	3·7	33·77	
Gin ...	Shorthorn ...	Aug. ,,	633	4·7	33·32	
Lass ...	Ayrshire ...	19 April ,,	529	5·6	33·17	
Laura ...	,, ...	20 May ,,	703	4·2	33·06	
Pee-wee ...	Holstein-Sh'rth'rn	6 April ,,	555	5·5	34·18	
Linnet ...	Ayrshire... ...	Aug. ,,	896	3·2	32·11	
Haze ...	,, ...	Nov. ,,	663	4·4	32·67	
Clare ...	Jersey	21 Aug. ,,	449	6·3	31·68	
Ethel ...	Grade Holstein	22 Aug. ,,	537	5·0	30·07	
Reamie ...	Holstein-Sh'rth'rn	Oct. ,,	686	4·1	31·56	
Whitefoot ...	,, ,, ...	28 Sept. ,,	740	3·5	29·00	
Butter ...	Shorthorn ...	22 Aug. ,,	625	4·1	28·70	
No. 6 ...	,, ...	Aug. ,,	516	5·0	28·89	
No. 1 ...	,, ...	Aug. ,,	881	3·0	29·60	
Gurney ...	,, ...	Aug. ,,	722	3·7	29·91	
Honeycomb	,, ...	23 Aug. ,,	665	3·9	28·98	
Lemon ...	Guernsey-Sh'rth'n	Aug. ,,	679	3·8	28·90	
Dripping ...	Holstein-Sh'rth'rn	28 Nov. ,,	622	4·2	29·25	
Mona ...	,, ,, ...	Oct. ,,	735	3·3	27·16	
Restive ...	Shorthorn ...	21 Aug. ,,	731	3·5	27·83	

The cows were grazed on different fields during the above period (no hand-feeding).

I wish to point out that, after many years of careful observation, I have come to one conclusion regarding the College herd—viz. we cannot obtain the best results because of the constant change of milkers, together with the fact that, no matter how careful one may be, "learners" occasionally milk our best animals.

SHOULD COWS BE STRIPPED?

Should cows be stripped after milking or not? Discussing this question in an English journal, Professor McConnell, the eminent English dairy expert, says that he is one of those who all his life was accustomed to see cows stripped out by a responsible person, who followed after the regular gang of milkers; but recent events caused him to change his mind as to the advisableness of the practice. Many authorities have pointed out aforetime that, as the milk secretion was intimately connected with the nervous organisation, the stopping of the milk and then coming back to start it again were doing the cow harm, as it amounted to restarting of the nervous energy. About a year ago Professor McConnell stated his belief that stripping was absolutely necessary. He now begs to take it all back, as since then he has tried his cows the other way, with the most satisfactory results. They are now milked out at one sitting, and if a small quantity be left in the bag, the professor argues, it does the cow no the producer, who, unfortunately, knows not the bad practices of the trade and possible gain then in stripping, he contends that it is discounted by the harm done to the cow by the stripper in starting her nervous force once more. Alongside of the cessation of stripping, however, another practice has also been abandoned—that is, the changing round of the gang of milkers, so that each cow is milked by each milker in rotation; every man now sticks to his own lot of cows, and as one cow drops out and another comes in the lots are kept as equal as possible. As far as Professor McConnell can see, the results to the cows, to the milkers, and to the milk yield are eminently satisfactory, and he, for one, will not go back to the old system.

FEEDING THE CALF.

Some dairy farmers always remove the calf from the cow as soon as it is born. This is all very well if the well-being of the calf is not a consideration, but, although the latter will thrive fairly when hand or bucket fed, it will never become such an animal as that which is allowed to remain for the first two or three weeks with its mother. To all appearance the milk is the same, and the calf gets as much as in the natural way; but, for all that, there is a marked difference in the results, and it is undoubted that the sucking calf will not suffer from such complaints as scouring to anything like the extent that the bucket-fed calf experiences.

TREATMENT OF DAIRY UTENSILS.

When cleaning dairy utensils, always rinse them first with cold water. If hot water is used, the sticky albumen coagulates on the sides and bottoms of the tins and is very troublesome to remove. After rinsing with cool water, wash thoroughly with hot water, using plenty of alkali, such as washing powders or caustic soda, and "elbow grease." Then again rinse in fresh, hot water, and set them in the air to dry.

THE CURE OF MAMMITIS.

Mammitis, an inflammation of cows' udders (causing a form of diphtheria in human beings), which threatens to overwhelm the dairy herds of New Zealand, has been successfully attacked by a German specialist by injections. The disease germs gain admission through the milk canals, and the German therefore attacked them along the same channels. He first thoroughly milked the udder, and then cleansed it with warm soapsuds and a 3 per cent. solution of creolin. After the udder had dried, injections were made into the milk cisterns with solutions containing 5 per cent. creolin or camphorated oil. The treatment was repeated three times daily, and in nearly all cases brought about prompt improvement.

Horticulture.

FLOWER GARDENING.—No. 2.

BY THE EDITOR.

PLANTS SUITABLE FOR OUTDOOR CULTURE.

ROSES.

Of all outdoor flowers, roses deservedly take first rank. However humble or modest the garden may be, the rose is sure to find a place in it. Although not indigenous to our climate, there are few countries in which the rose has found a more congenial home, and by a careful selection of the best varieties a display of bloom may be obtained throughout the year. It is about the most useful plant that can be found in any garden. The variety of colours, the quantity of blooms that the plants produce, and its delicious perfume, place it above all others.

That there is a growing demand for roses cannot be doubted, but the amateur should be very careful in the manner in which he attempts to plant roses when he receives them from the nursery. For a situation, a site apart from other plants should be assigned to them, if possible—open, but sheltered from high winds, and not surrounded by trees, as closeness has a tendency to cause mildew and other diseases.

They adapt themselves to almost any soil, but that which is specially suited to them is a deep loam of a greasy nature. If such is not to be obtained, the best must be made of the conditions at hand. If the land is strong, retentive clay, it should be thoroughly drained, as in no case will the cultivation of the rose be a success where the drainage is at fault. Stiff, heavy soils may be rendered quite friable, and their fertility greatly increased by burning in dry weather. To do this, all that is required is to break up the ground into a fallow, and, when fairly pulverised and dry, by the aid of a little wood or grass it is burnt, when the consistency will be quite changed from a stiff unworkable clay to a free and open condition. It is essential in planting that the habit of the variety should be understood, as the tender and more delicate kinds are often crippled, as it were, through being planted along with their more robust and vigorous relatives. When planting, see that the roots are well spread, and cover them with soil, and press as firmly as possible; most of the failures in rose cultivation arise from loose planting and using fresh stable manure, which is fatal to the rose. Any manure which is mixed with sawdust should be studiously avoided, as it makes the soil too loose and sour, and also attracts white ants. The rose will take any amount of manure after the first year of planting if it is thoroughly decomposed, or, better still, if it is in a liquid state, with a good mulch around the plants to keep the ground moist. Then, when watering, the water will all the sooner penetrate to the roots, and gradually work the manure down. Artificial manures are, in some cases, good, but if the supply is not constantly kept up the plants die back, and even at the best it seems only to put false life into them. Bone-dust is really good, as the plants are continually fed as the bone slowly decomposes. Its use also ensures freedom from seeds of weeds and grass, always contained more or less in natural manures.

After planting, give a good watering. Should any of the plants have become shrivelled in appearance through exposure or careless packing, they will soon recover if placed lengthways in a trench and covered with about 3 inches of soil and well watered. In three or four days they may be taken from the trench and planted with safety.

PRUNING.

Pruning forms an important port of rose culture. No definite rule can be laid down for pruning roses, as the habit of each variety has to be considered, but generally it may be taken that of the two classes, dwarfs and climbers, dwarfs may be pruned to any extent as a rule, and the more severely they are pruned the finer are the flowers. A fine effect may be produced in a bed, especially when it is large and of circular form, by planting either a climber trained to a pillar or a dwarf rose worked on a tall stem (standard), surrounded by other standards, decreasing in size to dwarfs at the edge. Climbing roses should have the old wood cut out annually, and the young shoots trained in their places. Train pillar roses with one strong leader, remove weakly branches, and shorten in all laterals.

Moderately weak-growing hybrid perpetuals require to be pruned down to two or three eyes, the weak and crowded shoots to be taken out. The robust will require the same thinning out of superfluous wood, while the strong shoots must be pruned down to 6 or 8 inches in length, and the smaller ones to 4 or 5. If the shoots are left too long, the plants become weaker after each pruning. Some of the vigorous-growing hybrid China and hybrid Bourbons require to be left long, or they will not bloom. Remove weak shoots, old wood, and branches which cross each other. By pruning half your roses six weeks before the others, a succession of bloom is secured. Experts hold varying opinions as to when and how different varieties should be pruned, but it is really a matter of soil and climate. Blooms are produced only from new, well-ripened wood of the previous year's growth, so it must be remembered that new wood each year is a vital necessity—that it pays to rejuvenate the trees by replacing old standard limbs with new growth when development seems to be stagnating, and also that the first work of the pruner is to cut out all dead wood and weak or soft watery shoots. Bourbons should be cut as soon as they have finished flowering. The hybrid teas resulting from the hybrid perpetuals crossed with tea and noisettes should be pruned according to habit and growth. As a rule, they do not need hard pruning, but sorts like Lady Mary Fitzwilliam can be pruned close. Tea, noisette, and Banksia roses should not be pruned early in cold, frosty districts, but hybrid perpetuals and Bourbons will not suffer by it. With rampant growers it is sometimes advisable to tie down the strong shoots, as this checks growth and induces flowering. Removing leaves also lessens vigour. Two roses, pruned at different times, will not flower together. Tea roses do not require severe pruning.

PEGGING DOWN.

Under good cultivation, the result of "pegging down" is a bed of roses, showing a mass of first-class bloom, not to be equalled under any other known system. The Géant des Batailles is magnificent, and others would doubtless prove equally effective. From strong, healthy roses, on their own roots, train five or six stems from the ground of equal length. When they are quite ripe, and before the buds break, prune them all to 18 inches or 2 feet in length. Have sufficient hooked pegs ready, and carefully bend down the shoots one at a time, without straining, flat on the ground, pegging them firmly down. The shoots should be arranged at equal distances, and will thus radiate all round from a common centre. Almost every bud will produce a spur with a splendid head of bloom, and a batch of strong shoots will grow upwards from the centre of the plant. When the bloom is all over, the old shoots are all cut away clean, and as soon as the new shoots are ripe they are pegged down in their turn as before.

PROPAGATING FROM CUTTINGS.

The work of the rose-grower commences generally with the propagation and growing of the plants, and the amateur usually begins with cuttings. Rose plants for forcing purposes are generally grown from cuttings of the new wood. The rule usually given for learning if the plants are in proper

condition to be used as cuttings—*i.e.*, when in bending a branch the wood snaps—does not hold good with roses, as cuttings should not be made until the buds in the axils of the leaves have become firm and hard.

Some consider that the lower buds on a stem are in good condition when the flower buds are ready to cut, while others believe that the best time for making the cuttings is when the buds begin to show colour. At any rate, the cuttings should be made before the leaf buds begin to swell. The cuttings made as soon as the buds have formed and the wood has lost its succulent nature will root quicker, and a much larger percentage of them will form roots or "strike," as it is called. If the variety is a new and a choice one, the blind shoots, or those that have not formed flower buds, are often used for making cuttings. While it may be done occasionally without marked injury, if persisted in the tendency will be to develop plants that form few flowering stems, and the results will not be satisfactory, so that the continued use of the blind shoots is not to be recommended. When the stems have long internodes, and particularly if it is a new sort, a cutting should be obtained from every good bud, but those at the lower part of the stem and all at the upper portion that are to any extent soft and succulent should be rejected. The cuttings of varieties with short joints should contain two or more buds. Cuttings should be from 1½ to 3 inches long, with one bud near the top at any rate, and with the lower end cut off smoothly at right angles with a sharp knife. If the upper leaf is large, about one-half of it should be cut away and the other leaves (if any) should be rubbed off.

The cuttings should be dropped into water to prevent their drying out, and as soon as possible should be placed in the propagating bed. This should contain about 4 inches of clean sharp sand of medium fineness, and should have heating pipes beneath to give bottom heat. Set the cuttings in rows about 2 inches apart and ¾ of an inch in the row, and press the sand firmly about them. At once wet them down thoroughly, and if the weather is clear and bright the beds should be shaded during the middle of the day for the first week. The propagating house should be kept at a temperature at night of 58 or 60 degrees, with about 10 degrees more of bottom heat. During the day it should be well ventilated to keep up the bottom heat, and thus promote root development, and to admit fresh air, but a temperature 10 degrees higher than at night is desirable.

In about three or four weeks, with proper care, every cutting should be rooted. The requirements for success as noted above are: Good cuttings, clean sharp sand, a proper temperature, shading when necessary, and an occasional wetting down of the bed in order that the cuttings may not at any time become dry. If the house is inclined to dry out, or, if the weather is bright, the cuttings, as well as the walks, should be sprinkled occasionally, and the ventilation should receive careful attention. It is best to use fresh sand for each batch of cuttings.

When the roots are ¾ of an inch long the cuttings should be potted off into 2 or 2½ inch pots, pressing the soil firmly. The best soil for the potting of rose cuttings is made of equal parts of leaf mould or decayed pasture sods and garden loam, with a little cow manure and bone-meal and sand in proportion to the heaviness of the soil. After being potted, the cuttings should be placed in a house with a night temperature of a little less than 60 degrees. They require the same care as other plants, careful watering with an occasional syringing to keep down red spider, proper ventilation, and an avoidance of draughts and direct sunlight for a few days being the main things desired.

Unless tobacco stems are strewn on the beds, it will be necessary to burn tobacco stems once or twice a week in the house or syringe them with tobacco water. From the time the cuttings are potted off until they have finished flowering and are ready to be thrown out or rested they should be kept growing, every precaution being taken to avoid a check if the best results are desired. Some prefer to grow the plants rapidly until they are in 4-inch pots,

and then give them a rest. As soon as the roots have filled the pots, and before the plants become pot-bound, shift to 3 or 3½ inch pots. If they have good care, the first batch will soon fill 4-inch pots, and will be strong enough to plant in the beds for early flowering, while the others as they come on can be repotted, and will soon be large enough to be transferred to the beds. Only strong, well-grown plants should be used. By early planting, not only can a large crop of blooms be secured during the summer, when there is a good demand at a fair price, but the plants will be so strong that they will be able to give large crops during the autumn and early winter, when they are most needed.

Cuttings may be rooted at various seasons of the year, and by several different methods. The commonest method is by means of dormant shoots taken as soon as the leaves have fallen and simply stuck in the ground, as already described, but if they are tied in bundles, laid flat on the ground, and covered with sand, except the points, each cutting forms a callus at its base in the course of the winter, and should then be planted out. Roses may be struck from growing shoots whenever they are in a condition of semi-ripeness, which is generally when the flowers fall; the cuttings are best to have heels. The treatment should be such as to keep the leaves as fresh as possible; or they may be set in pots, and, as soon as each has formed a callus, may be removed into a brisk bottom heat, when in a short time they will be fit to be potted off. If roses growing in pots are forced the young shoots may be taken for cuttings as soon as they are 3 or 4 inches in length, inserted in cutting pots, and placed in the propagating frame. Tea-scented roses are most amenable to this kind of treatment, although other sorts may be successfully treated in the same way.

Striking Rose Cuttings in Water.

The number of subjects that can be rooted from cuttings in water is much larger than is generally credited. Amongst them are roses, although they are seldom increased in this way. As a novelty it has its interesting features. A mode of striking cuttings of the kind in bottles of soft water is a plan as simple as it is practicable, inasmuch as cuttings taken off at any time during the summer will root in this way in from five to six weeks, after which they should be potted carefully in light sandy soil, and placed in a cool frame for a week or so until established, when they are ready for planting where required. The cuttings should be cut clean below an eye joint, and none of the bark bruised. It is a help to make one or two other cuts between the lower eyes, but low enough to be under water. The bottle may be of any convenient size, and may be placed in the greenhouse or room window, as the only attention they require is the filling up of the bottles with water as it evaporates. Another plan after rooting is to fill up the bottle with a compost of light soil, and then pour off as much as possible of the water. When the soil is fairly dry the bottle can be broken, and the young plants potted on. Impatius sultani, English ivy, nasturtiums, and many other things will readily root this way. For the above instructions in raising pot plants from cuttings I am indebted to the "Garden and Field," Adelaide.

Budding Roses.

Roses can be budded when the sap is rising freely in both stock and bud plant. Sap can be forced to rise by liberal watering a few days previously, and better results can be secured by liberal use of very old manure from a cow-yard. A week after budding, the ties should be loosened, else the growth will be strangled by the bandage. Cotton wick is the best for ties or bandages, because it keeps cool and slightly damp, whilst raffia or bast is dry and hot. Suckers will arise from the roots and stems of roses that have been budded, but these should be at once removed. The stems of standards should be protected against the afternoon sun, otherwise the bark will be burned. Buds

should be inserted close to the stem, else the new growth may be removed when cutting back at the end of the season.

In this climate, roses on their own roots generally succeed best, although budded and grafted plants rarely fail to thrive when properly treated. The most suitable stock is that known as the evergreen rose (*Rosa sempervirens*). In Queensland, the cultivation of the rose upon its own roots is generally practised, as the growth and ripening of the wood are so rapid that it is not necessary to resort to budding and grafting, as in Europe, to promote early maturity. By adopting this method we also escape the annoyance of suckers from the stock, and risk of the bud being broken off in high winds. Handsome Standards may be grown from plants on their own roots, by selecting a straight, vigorous shoot of the required height and pruning away the rest of the plant. This stem should be firmly staked perfectly upright; when the wood is ripe, shorten it to about 4 feet high, and allow no buds to grow except the four top ones, from which a well-balanced head may gradually be formed, which, when in proportion, will be the same distance across as the head is from the ground.

The stocks most in use are the Dog Rose, China Cluster, Manetti, Celine, and the Black Boursault. The Dog Rose is used for standards and half-standards. For dwarfs, dwarf standards, pillar roses, and for potting, the Manetti is preferable. When dwarf roses which have been budded are planted out, it will be desirable to plant them quite over the collar of the bud, so that the union of the stock and bud is perfectly covered. If the plants are budded low, there will be little difficulty in planting them thus. The Maiden's Blush is the favourite stock in Melbourne, and may probably be found suitable for Queensland.

SOME SUITABLE VARIETIES TO PLANT.

It must be remembered that we grow roses with different ends in view. One grower devotes his time to raising blooms of exhibition standard; another cares not so much for individual excellence of flower as to having his garden a mass of bloom; while a third prefers flowers for cutting for decorative purposes. Some varieties are valuable in all three directions, while others are pre-eminently so in only one. For exhibition, we require roses whose chief characteristics are beauty and perfection of form, combined with size, brightness, and distinctiveness of colour. These qualities do not always go with vigour of growth and abundance of bloom. If they do, we have roses which deserve pre-eminence; but, unfortunately, a few splendid show varieties are only to be grown for show purposes.

For garden decoration we are not so interested in the perfect elegance and symmetry of the individual flower. We require quantity rather than quality, with a healthy and vigorous habit of growth.

If the desire be for the purpose of cutting for decorative purposes, either for personal wear or for the adornment of our rooms, we are not so anxious for size. We are careful to select flowers which are most attractive in the bud. We require beauty of form, brightness of colour, with as much as possible of the character too often neglected—namely, perfume.

Freedom of bloom is a leading consideration, and white varieties are desirable. It is not often that all these qualities are combined in a single variety, and our estimation of the value of a variety must be largely influenced by the purpose for which we require it.

FOR EXHIBITION PURPOSES

beauty of form, with fair amount of size, is the point of perfection. Size, without symmetry of form, is valueless on the show table. There must be no malformation of bloom or symptoms of a double heart. What is required is a regular shape with full, somewhat high centre, smooth circular outline, and perfect arrangement of petals. A long rose is preferable to a globular rose, and a globular to a flat rose. There must be no suspicion of the eye in sight. Then add size, if possible, brightness of colour, and fragrance. The last, valuable though it be, is a point that can never be estimated on the show table.

Some Good Tea Roses.

Some time ago, said Mr. George Watkins, in a paper read before the Horticultural Society of Queensland at one of their meetings, three leading experts were requested by the National Rose Society to draw up a handbook on "How to Grow and Show Tea Roses." Their list of twelve best exhibition tea roses is as follows:—1, Bridesmaid; 2, Catherine Mermet; 3, Cleopatra; 4, Comtesse de Nadaillac; 5, Innocente Pirola; 6, Maman Cochet; 7, Maréchal Niel; 8, Mrs. Edward Mawley; 9, Muriel Grahame; 10, Souvenir d'Elise Vardon; 11, The Bride; 12, White Maman Cochet.

Their second twelve is as follows:—1, Anna Olivier; 2, Ethel Brownlow; 3, Golden Gate; 4, Hon. Edith Giffard; 5, Madame Cusin; 6, Madame de Watteville; 7, Madame Hoste; 8, Marie Van Houtte; 9, Medea; 10, Souvenir de S. A. Prince, better known here as the Queen; 11, Souvenir d'un Ami; 12, Sylph.

These are all good roses, and, no doubt, the best in the British climate. For us, in Queensland, it will need revision. The first twelve contain the names of three roses which do not suit Queensland. Cleopatra is always classed as poor in growth, and difficult to manage. It is useless in Queensland, and so is Innocente Pirola.

Comtesse de Nadaillac stands in the front rank of varieties gaining distinction in the home shows as champion bloom. It is there a flower of surpassing beauty; with us it is a poor grower and shy bloomer, little grown, and seldom shown.

Of the second twelve Marie Van Houtte, Medea, and Madame De Watteville are among our best. Madame Hoste and Golden Gate deserve to be more grown than they are, but the rest are very moderate in growth, and not to be strongly recommended. Strange to say, Niphetos, Souvenir de Thérèse Levet, and Perle des Jardins do not find a place.

The following is the selection I would recommend for the neighbourhood of Brisbane at least:—Maman Cochet, White Maman Cochet, C. Niphetos, Souvenir de Thérèse Levet, Maréchal Niel, Souvenir d'Elise Vardon, Marie Houtte, Perle des Jardins, Medea, Mrs. Edward Mawley, Muriel Grahame, Madame de Watteville. (Second twelve): The Bride, Catherine Mermet, Ernest Metz, Lord Tarquin, Empress Alexandra of Russia, Mdlle. Francesca Kruger, Madame Hippolyte Jamain, Sylph, Madame Hoste, Madame Elie Lambert, Souvenir de S. A. Prince or the Queen, Madame Camille.

For garden decoration, most of the above may be chosen, adding Edouard Littaye, Wm. Allen Richardson, Souvenir de Rosieriste Rambeaux, Leo. XIII., and François Dubreuil.

POULTRY FARMING.

One of the greatest mistakes made by those who dream of making money by means of a poultry farm is, that they base their calculations on the returns in eggs and chickens upon the results of keeping about 20 hens. They argue that, if 20 hens will produce so much, 100 will produce five times as much. Many have tried it, but there is no record of success. The best returns are those obtained from the fowlyard on the farm. It stands to reason that this should be so. On the farm, the fowls practically feed themselves. They have many acres of run, where they find a variety of food in the shape of insects, grubs, grain, and green stuff. The exercise they get makes them hardy and strong. On a poultry farm, the birds are confined to small runs. All their food has to be bought, and the herding together of large numbers of fowls in fixed houses usually results in the development of disease. A farm without poultry is like a buggy on three wheels. Every farmer should keep poultry. If he has an orchard, the fowls will keep it clean by scratching away the weeds and destroying injurious insects.

Viticulture.

NOTES ON TWO NEW HYBRID GRAPES.

By Dr. THOS. L. BANCROFT

For some years past I have endeavoured to produce varieties of grapes by crossing Isabella and Lenoir (which kinds grow to perfection in the vicinity of Brisbane) with varieties of the European stock, *Vitis vinifera*, such as Black Hamburgh, White Portugal, Muscat, &c.—new varieties that would grow equally well and with a better flavour than Isabella.

I succeeded in producing a good kind by crossing Isabella with White Portugal, mention of which occurs in the "Queensland Agricultural Journal," Vol. XII., p. 425. The late Mr. J. G. Cribb, who devoted a great deal of attention to viticulture in Queensland, regarded it as an "excellent variety." Since then I have been fortunate in obtaining another distinct variety from the same parents—viz., Isabella × White Portugal. The question might be asked: How is that, the parentage being the same, these two hybrids are so different in flavour, form of bunch, &c.? One naturally would imagine that they would be identical, or at any rate nearly so. To me it appears very remarkable, and it may be that the pollen parent was really not the same in both. I used to get the pollen from Mr. A. B. Webster's garden, at Deception Bay, from a number of old vines, apparently all White Portugal; but it is possible, if they were critically examined by an expert viticulturist, he might detect differences, for there are several grapes which resemble White Portugal closely.

White Hybrid No. 2—Isabella × White Portugal.

A seedling from Isabella, fruited some years ago, when six years old, has grown into a large vine, with the vigorous growth of Isabella and not appreciably injured by fungus blights; a prolific bearer of remarkably long, loose bunches of white very thin-skinned grapes; when ripe the berries have a faint tint of pink and are transparent; taste very agreeable, entirely different from my White Hybrid No. 1 and from Isabella, partaking of the quality of the pollen parent.

White Hybrid No. 3—Lenoir × White Portugal.

A seedling of Lenoir; a very vigorous grower, surpassing any other seedling I have raised; it is four years old, and has just fruited for the first time. The bunches are small, the berries only a little larger in size than those of Lenoir, white in colour, thick skinned; in flavour they are too sweet, and, being small, the seeds are much in evidence as in Lenoir. It is possible, however, that this variety might improve as the vine ages. My White Hybrid No. 2 was not so good the first year it fruited as it is now.

I have in cultivation four seedling vines, raised by the late Dr. Joseph Bancroft, possibly hybrids; but I have no literature on their parentage. I should be pleased to supply the Department with cuttings of them and also my own productions for cultivation and report on their merits.

Mr. Rainford spoke favourably recently of a cross, in which Hermitage was the pollen parent, produced by the late Dr. Bancroft; he considered it worthy of experiment.

It is possible this is one of the varieties I succeeded in saving. The original vine grew at the doctor's residence in Wharf street; a good grower and bearer of abundance of bunches of small black grapes with a nice flavour.

Tropical Industries.

ZAPUPA FIBRE.

Much interest has been evinced in the zapupe (or zapupa) plant of Mexico, since we published an account of it in the Journal in December, 1906. At the request of several of our friends, we republish the article in question, together with a further report on the plant, published in "Tropical Life," by Mr. H. J. Keane, Experts Translating, Alliance, Dulwich.

NEW FIBRE PLANT—THE ZAPUPE.

We are indebted to the courtesy of Mr. W. B. Murray, editor and manager of the "Mexican Investor," for the following particulars concerning a very valuable fibre plant which is indigenous in the Mexican State of Tamaulipas:—

Marked interest has been developed in Mexico during the last year in the hitherto unappreciated fibre produced by the zapupe plant, which has been employed by the Indians for centuries in the manufacture of various articles, such as rope, bags, lariats, bridles, cordage, and seines. The zapupe fibre posssesses many advantages over other similar fibres, and its pronounced merit as a commercial article will inevitably render it a source of great wealth to Mexico, where it appears to be indigenous. A tract of land exclusively devoted to its culture and for experimental purposes is now in full bearing, and the results obtained have surpassed the most sanguine expectations.

The zapupe is quite similar in appearance to the henequen plant of Yucatan. The leaves, however, are not so fleshy and are longer. Leaf for leaf, it produces slightly less fibre than the henequen, but the total yield of fibre is greater, owing to the fact that there are double the number of leaves on the zapupe plant, which will yield seventy-five to eighty leaves. Its fibre is white when properly extracted, resistant, and flexible.

Rope made from it does not kink or mildew when exposed to dampness or immersion in water, and will freely run through ship blocks and pulleys, in which respect much difficulty and annoyance have been experienced with inferior fibre. Zapupe will yield the first cutting of leaves three years from the time the young scions are planted, and has a great advantage in this respect over other fibre-producing plants, which, as a rule, attain their period of production in five to seven years. From the first to the third year after beginning to yield it will produce 100 to 110 leaves annually, gradually decreasing to between seventy-five and eighty leaves, and retaining that production consecutively for fifteen years. The fibre extracted will, on an average, be from $2\frac{1}{2}$ to 3 lb. annually for each plant, although in exceptional cases, where the plants have been given special attention, they have produced as high as 4 lb. The leaves may be harvested throughout the year, from twenty to twenty-five leaves being cut every ninety days. If the leaves are not cut regularly, the life of the plant will be materially shortened—at the end of five to seven years it will throw up from the centre a long stem about 8 feet high, and will shortly thereafter cease producing leaves and die. If the leaves are constantly cut, this does not occur until the fifteenth year, and frequently not until the eighteenth year. Branches develop from the summit of the stem, and in time become diminutive zapupe plants, which eventually become detached and are scattered over the ground, where they take root and become strong, vigorous plants. This stem produces from 2,000 to 2,500 of these tiny scions; in addition to this, numerous scions spring from the roots of the stump.

The plant requires but little attention. After the land has been cleared and scions planted, $6\frac{1}{2}$ by $6\frac{1}{2}$ feet apart each way, which permits 1,000 to be planted to an acre, it is necessary only to keep the young plants free from weeds. After the second year little or no cultivation is required, as their shade will check all undergrowth which might be injurious to them. Where vegetation is very rank it may be necessary to give the land a light cleaning once a year to permit labourers to pass freely from plant to plant to cut the leaves. This is a very simple operation, as the labourers are supplied with a long-bladed knife, having a sharp hook-like curve at the end, which is introduced between the stump and the leaf, and with a dexterous upper jerk the leaf is cut off close to the stump. This is essential, as an uneven, ragged stump will deteriorate and often die. After the required number of leaves are gathered and assembled in lots of fifty, the long needle-like apices are cut off and the leaves made up in bundles, tied, and carried to the cleaning-shed, situated so as to be within convenient reach of the plants. The machinery is either of the old plain type, with a capacity of cleaning 3,000 leaves in ten hours, or of the recent modern type, with a capacity of 100,000 leaves in ten hours. The leaves are fed at the receiving table of the machine, and the perfectly cleaned fibre is delivered at the outlet as fast as one man can handle it. The plain machines cost 300 dollars (£60) to 500 dollars (£100) gold, and the large automatic machines from 2,000 dollars (£400) to 3,000 dollars (£600) gold.

A plant one year old will produce fibre within two years. The present cost of such a plant is 3 cents; smaller plants may be had for $1\frac{1}{2}$ cents ($\frac{3}{4}$d.) apiece. With the cost of labour but 50 cents (2s. 1d.) a day, and the labourer boarding himself, it is estimated that the cost of producing 1 lb. of fibre is from 2 cents (1d.) to $2\frac{1}{2}$ cents ($1\frac{1}{4}$d.) a lb., delivered on board. As samples have been recently submitted to fibre experts in New York City, who estimated that the price would range from 8 cents (4d.) to 9 cents ($4\frac{1}{2}$d.) gold, equal to from £37 to £41 13s. per ton, it is evident that, after deducting cost of production, a very handsome profit would be realised.

As the plants approach their final leaf production, care is taken to plant young scions between the rows of old plants, so that they will reach maturity as the others die out. The plant is extremely vigorous, as the scions can be removed from the ground, allowed to remain under cover for weeks without the least care, and, when planted, will grow vigorously and suffer no evil effects. The zapupe will thrive in almost any location, and apparently does well on all kinds of soil, but seems to respond quicker in a slightly sandy and rocky environment.

ZAPUPA FIBRE.

A sample of a new fibre is now being exhibited in the show cases of the Commercial Museum at Brussels, and the following data regarding it have been supplied by the Belgian Legation at Mexico. The zapupa, from which this fibre is obtained, is a variety of agave highly appreciated by the ancient Mexicans, and from which they (like the present-day Indians) obtained a long, white, flexible fibre of great strength, and not subject to decay in water. The zapupa has twice as many leaves as the Yucatan "henequen," and as its fibre is just as good (if not better for certain purposes) it seems to have a great future before it. Besides, "henequen" only produces after five to seven years, whereas the zapupa yields its first crop three years after being transplanted.

The zapupa has only been discovered quite recently, and, so far, it has not been exploited upon a commercial basis. Between the third and sixth year it produces from 100 to 110 leaves yearly, and continues its production for from ten to twelve years, the yield in the last few years being from fifty to seventy-five leaves per annum. As with all the agave, flowering is the sign of senility and approaching death of the plant; however, if some of the leaves be cut annually, the flowering period will be retarded for from twelve to fifteen years. Each plant yields about 2 lb. of fibre annually, value from 15 to 16 centavos.

Plate XI.

Sisal Hemp Plantation on Peel Island, Moreton Bay.

Plate XII.

Budded Mango-tree Grown by Mr. McDonnell, "Ivanhoe," Yeronga.

Strong spines protect it from the ravages of cattle, &c. It grows freely in the province of Vera-Cruz, and does best on sunny slopes and sandy soil; shade and moisture are prejudicial to it. It is propagated by means of cuttings, which are taken from the eight to ten months old plant and put into pots; when one year old they are bedded out in the proportion of 2,000 to the acre. They require very little attention, and a crop of leaves may be cut every year. Within, say, four years from planting, a yield of 2,500 kilos. of fibre per acre would be secured, if exploited upon a sound business basis, which would give a profit of 450 fcs. per acre. So far, there is no market price quoted, but the fibre has been valued at New York at from 8 to 9 centavos gold per lb., all expenses paid by the producer. With a capital of 500,000 fcs. from 1,000 to 1,500 hectares of suitable land could be purchased, and 500 put under zapupa; the rest could be used for grazing cattle, erecting buildings (station houses, fibre-making plant, stores, &c.), and at the end of the fourth or fifth year a profit of 225,000 fcs. would be secured on the zapupa fibre alone. One million plants have just been planted out in Tuxpam, and it is hoped that 500,000 will be in full production in about two years. Offers have already been received from two European firms to buy the annual production, but so far no agreement has been definitely entered into, as the growers wish to remain independent if possible.

SISAL HEMP AT PEEL ISLAND.

When Peel Island was devoted to the purposes of a Quarantine Station, it was thought that a portion of the cleared land might be utilised for the purpose of growing vegetables for the inmates of Dunwich Benevolent Asylum, from which it is only a couple of miles distant. The experiment was tried by successive Home Secretaries, but, notwithstanding the apparent richness of the dark sandy loam, all attempts to produce vegetables proved failures. About four years ago sisal hemp was planted, and this has evidently found a congenial home. The original area of about 4 acres has grown with great rapidity, and has long been ready for harvesting. We believe there are now about 16 acres planted but, if nothing is done to utilise the leaves, the plants will flower and the leaves will then be useless. It only needs to recall what has been done in the way of obtaining fibre from a single acre of plants at St. Helena, to realise what could be obtained from the area ready for harvesting at Peel Island.

A FINE YOUNG MANGO TREE.

Our illustration depicts a very well-grown mango tree, grown by Mr. McDonnell, Ivanhoe, Yeronga. Mr. McDonnell budded the tree three years ago, and it bore fruit two years afterwards—in the third year. Already 2½ dozen fine fruits have been gathered, and the tree is still laden with fruit. After budding, the bud took some time to strike. The operation was performed as described by Mr. Benson—that is to say, the bud was taken with a square piece of bark attached, and accurately fitted to a space on the young tree from which a similar piece of bark had been removed. The fruit is of fair size, scarlet on one side, and slightly acid in flavour, with scarcely any fibre.

GENERAL INDEX.

A general index to the first nineteen volumes of the "Queensland Agricultural Journal" will be issued during the month. The index is so arranged that each title of an article, which will admit of it, is indexed under different headings. The illustrations, as also the excellent articles on the Flora of Queensland and New Guinea by Mr. F. M. Bailey, Colonial Botanist, are indexed separately. The index will be supplied at 1s. per copy.

Bacteriology.

EPIZOOTIC DISEASE IN DUCKS.

By C. J. POUND, Director of the Bacteriological Institute, Brisbane.

INFECTIOUS LEUKEMIA.

In a report on the subject of epizootic disease in ducks, to the Under Secretary for Agriculture and Stock, Mr. Pound says that the disease, if not new to Queensland, has not been described as existing here before. Following is a detail of the symptoms of the disease, inquiry into which is now being made by Mr. M. Fern, Poultry Expert to the Department:—

INTRODUCTION.—During the past twelve years I have had occasion to inquire into many destructive diseases occurring amongst poultry, particularly fowls and ducks. These outbreaks were shown, after careful bacteriological examination, to be either chicken cholera (Pasteur) or fowl enteritis (Klein). Quite recently, however, there came under notice an outbreak of disease, quite distinct from the above and occurring among ducks only, causing a mortality of over 60 per cent.

HISTORY OF THE OUTBREAK.—A gentleman at Red Hill informed me that the disease made its appearance very suddenly. At first he noticed about a dozen of young ducks looking very sick and refusing food, and, within three or four days, many of them were either dead or in a dying condition. The next day some of the older ducks became infected, as many as twelve being found dead at one time. After about fifty ducks had died, I was asked, at the suggestion of Mr. Fern, the Poultry Expert, to inquire into the matter. Having ascertained that the disease was of a bacteriological origin and of an infectious character, several recommendations were made with regard to its suppression—viz., complete isolation and segregation of all diseased or suspected birds, and thorough disinfection of the yards, feeding and drinking vessels.

NATURE OF THE DISEASE.—The disease runs a course of from seven to fourteen days. After an incubation period, which may last from three to five days, the birds show the first symptoms of the disease—viz., drooping wings and acute diarrhœa, with greenish mucoid evacuations. They become drowsy and somnolent, with their heads hanging down, and, refusing food, get gradually weaker and die. Owing to the infectious nature of the disease and the ready way in which the red corpuscles are destroyed, it has been named "Infectious Leukemia," at the suggestion of Veranus Moore, who first investigated various outbreaks of the disease in the United States.

HOW THE INFECTION IS SPREAD.—Like chicken cholera and fowl enteritis, this malady spreads precisely in the same manner. When once the disease has become established, the droppings of the birds contain the specific organism in large numbers, thereby favouring the contamination of the food, grit, and water taken by healthy birds that are enclosed in the same run. It is, therefore, easy to understand how readily the disease assumes epizootic proportions.

The disease may be carried from one yard to another by the agency of sparrows, or by the person who attends to the poultry taking infectious matter into a healthy yard on his or her shoes. It is also quite possible that the wind, in a minor degree, may be responsible for carrying the disease germs on dirt, leaves, or small pieces of wood over considerable distances, and so creating new centres of infection.

There can be little doubt that in many poultry runs the principal factor in the propagation of the disease is the want of good sanitary conditions, particularly in respect to the environment of food supply and water.

Nature of the Micro-organism.—The micro-organism which gives rise to this disease is a non-motile bacterium—really a short rod with rounded ends, and is a little more than 1·6 microns long and about 1 micron broad. In stained preparations from the heart blood they appear singly, in small clumps, and sometimes in pairs. They stain readily with fuchsine, gentian violet, and methylene blue, but are decolourised by Gram's method. In smear preparations from a diseased bird or from a young culture, the bacteria, as a rule, stain uniformedly. In many, however, there is tendency to show bi-polar staining. The latter feature can be well brought out by placing the freshly prepared smear, after drying, in a watchglassful of 5 per cent. carbolic acid for three minutes and then transferring it direct to methylene blue for about five minutes, afterwards washing, drying, and mounting in neutral Canada balsam. Specimens so prepared show the organisms with deeply stained and sharply defined poles, leaving the central portions perfectly clear.

Growth on Culture Media.—The bacteria grow well in beef broth, causing general turbidity within twenty-four hours. Eventually a whitish granular sediment settles at the bottom, leaving the upper portion of the broth perfectly clear.

On ordinary agar the growth is not very rapid. The surfaces of the small white colonies are convex, with sharply defined margins. If anything, the growth is more prominent than that of chicken cholera.

In glucose media there is no development of gas.

On gelatine the colonies are very much smaller than on agar, and there is no liquefaction of the media.

Temperature Requirements.—The organisms grow well at both room and incubator temperatures.

Vitality.—Attenuation is readily produced on culture media. Moreover, unless subcultures are frequently made the organisms will die out altogether.

Effects of Desiccation.—The bacteria readily succumb to the effects of desiccation. The organisms from broth culture or infected blood smeared on glass will only remain alive for about ten days.

Effects of Sunlight.—Exposure to the direct rays of the sun will completely destroy the bacteria within ten minutes.

Effects of Disinfectants.—A 1 in 100 solution of carbolic acid destroys the bacetria in active virulent cultures in five minutes, while 1 in 1,000 solution of Cyllin disinfectant produces the same effect in the same time, showing that it possesses ten times the germicidal efficiency of carbolic acid.

Post-mortem Appearances.—The feathers of the cloaca are slightly soiled a yellowish-green with the diarrhœal discharges. The flesh throughout the body has a distinct anæmic appearance. The lungs, lymphatic glands, and spleen are apparently normal. The liver is usually enlarged, dark-coloured, and slightly friable. Occasionally a few grey spots resembling miliary tubercles are present. The kidney is very light in colour, with marked injection of the blood-vessels. The heart is very pale, as though all the blood had been squeezed out of the muscular tissue of the ventricles. Very little blood, which is invariably very thin, is found inside the heart. The general anæmic condition of the whole of the body demonstrates that the most important change is to be found in the blood. This consists of a marked diminution in the number of red blood corpuscles, as shown by continued microscopical examination of the blood during the progress of the disease. With a decrease of the red cells there is a correspondingly apparent increase of the white cells or leucocytes.

ANIMAL EXPERIMENTS.—Before specimens of diseased birds could be obtained for investigation the disease had become somewhat attenuated, and the epizootic was declining, consequently the experimental animals (mice, guinea-pigs, rabbits, fowls, and ducks) only suffered from a local reaction, no cases proving fatal. Moore remarks, from his observations, that, although the disease is fatal to each of the animals above mentioned, comparatively large quantities of the virus are required to produce fatal results. In his experiments on fowls he states that where more than two fowls were fed upon infected viscera or pure culture one or more remained well. Several survived the feeding of large quantities (300 to 500 c.c.) of pure bouillon culture. And, again, the subcutaneous injection of pure cultures gave uncertain results. In a few fowls fatal results were obtained, but usually they remained unchanged after this treatment.

TREATMENT AND PREVENTION.—Owing to the nature of the disease, it is almost impossible to prescribe a medical remedy. It has, however, been suggested by some observers, when dealing with diseases of similar characters, to administer quinine sulphate in 1 to 2 grain doses, and in addition to place 1 per cent. of iron sulphate in the drinking water. Both sick and healthy birds should have a liberal supply of food and fresh water, and care should be taken that the poultry yards and houses are well ventilated.

The perches, coops, nesting-houses, and the interior of all poultry-houses should be thoroughly brushed over with a 1 in 500 Cyllin solution, and afterwards treated with freshly-prepared lime wash. Feeding troughs and drinking vessels should be scalded, then treated with Cyllin solution, and afterwards exposed to the direct sun's rays for several days.

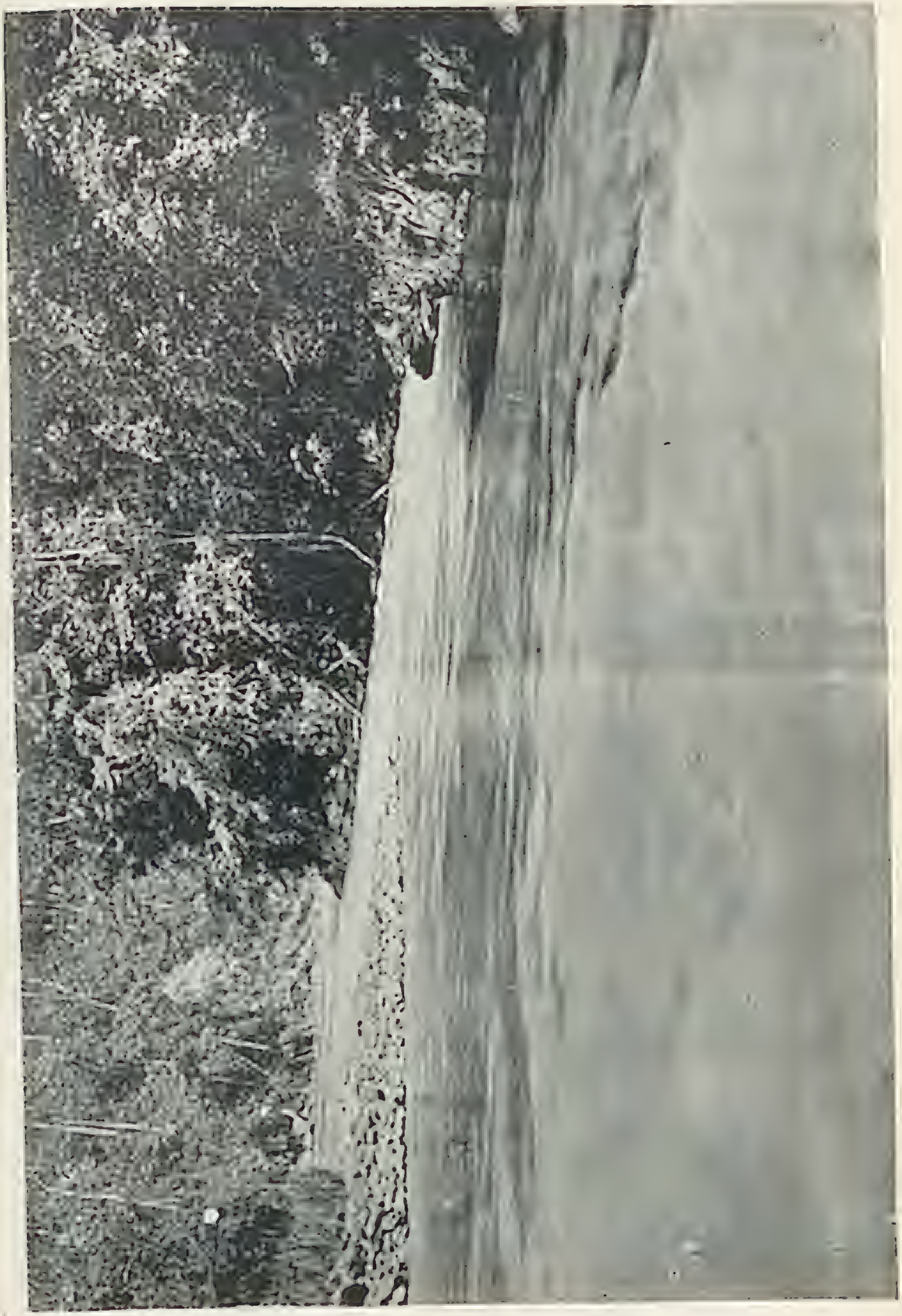
Isolation and segregation are absolutely necessary in preventing the spread of the disease. Those birds that are apparently unaffected should be separated from the sick ones, and placed right away in a fresh, clean enclosure. The ground of the infected enclosure should be continually raked over and thoroughly mixed with dry lime, and no birds allowed to run over it for at least a fortnight.

Of special interest is the fact that this disease is not so dangerous as fowl cholera, as very large quantities of the specific organisms are necessary to set up fresh centres of infection; whereas, with fowl cholera a very few organisms, introduced either by injection or inoculation, will produce a fatal form of disease. It is highly probable that many outbreaks of infectious leukemia are mistaken for fowl cholera, and no doubt large numbers of birds die annually from the disease, which might otherwise be prevented, provided the poultry farmers with united efforts removed those unfavourable conditions which assist in the spread of all infectious maladies. It is, therefore, necessary to provide pure water and good wholesome food for the birds, and keep their houses and yards in as perfect a sanitary condition as possible.

LAND IN NEW GUINEA.

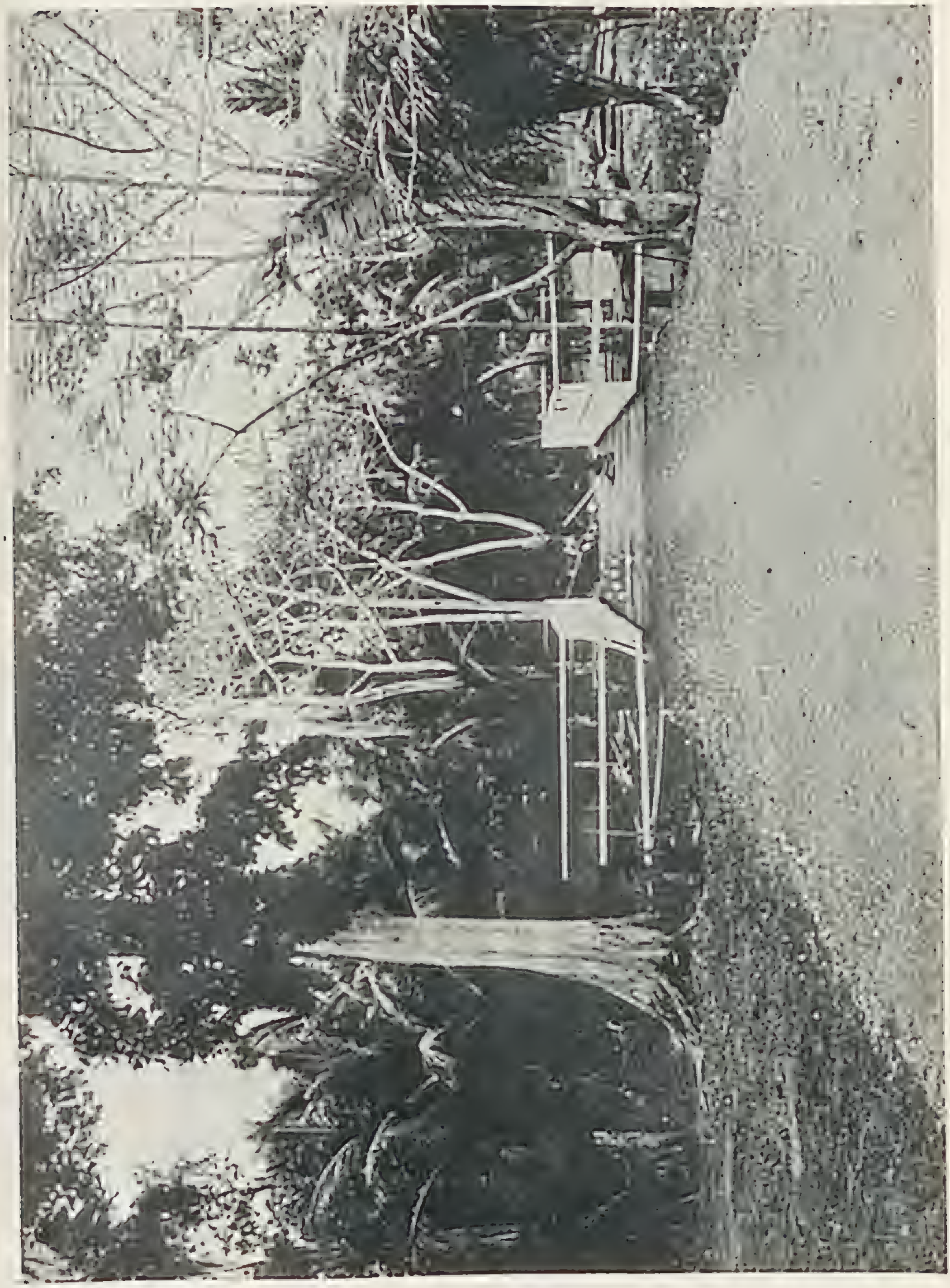
The accompanying illustrations give a very fair idea of the unimproved scrub lands of that part of New Guinea lying about 30 miles eastward of Port Moresby, the capital. The road scene is on the rubber plantation belonging to Mr. A. C. English (for many years a magistrate in the possession), at Barodabo. The bridges, of which there are six on a well-made road 3 miles long, were built entirely by native labour, under Mr. English's supervision, and would do credit to a Queensland contractor. The second view is a scene on the Kemp Walsh River, in the same neighbourhood. From the appearance of the rushing water of the river, this would appear to be ideal country for the use of water power.

Plate XIII.



Virgin Scrub Land on the Kemp-Walsh River, Papua.

Plate XIV.



View on Mr. English's Plantation, "Barodabo," Papua.

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1907.												1908.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
North.													
Bowen	2·53	3·74	1·97	0·39	3·46	2·87	Nil	1·28	0·51	0·06	3·71	6·39	10·14
Cairns	18·36	11·49	3·26	3·35	8·65	4·45	0·12	0·39	1·35	0·68	5·35	28·33	27·02
Geraldton	29·58	25·26	4·58	6·08	21·91	8·54	2·39	4 66	1·36	1·42	6·45	33·82	44·39
Herberton	10·56	11·77	2·05	0·90	1·57	2·71	Nil	0·11	0·12	0·17	3·41	9·57	9·29
Hughenden	1·98	3·83	1·17	0·16	1·34	0·95	1·16	Nil	Nil	1·66	0·66	7·75	0·98
Kamerunga State Nurs.	15·78	14·82	4·87	2·80	9·33	5·29	0·13	1·15	1·19	0·53	2·76	29·82	...
Longreach	1·22	0·49	1·88	0·85	0·93	0·40	0·49	0·04	Nil	1·08	2·83	9·12	Nil
Lucinda	12·38	23·82	4·53	3·92	19·29	6·34	0·29	1·05	1·19	0·25	0·43	23·38	25·93
Mackay	2·72	6·42	8·01	1·58	*6·09	5·04	0·27	0·25	0·12	0·12	5·76	9·70	9·28
Rockhampton	4·15	4·42	3·05	0·44	0·94	4·16	0·84	0·47	Nil	0·47	3·72	4·42	3·84
Townsville	12·49	7·75	7·37	1·03	3·11	2·38	Nil	0·07	0·14	0·03	2·82	24·26	12·21
South.													
Barcaldine	3·44	0·43	1·51	0·82	0·34	2·03	0·87	0·06	Nil	1·21	1·54	11·74	Nil
Beenleigh	4·75	3·88	4·17	0·58	4·70	4·92	0·71	0·58	Nil	1·73	2·81	4·48	2·41
Biggenden State Farm	5·77	3·55	10 91	0·34	4·02	5·24	1·51	0·96	0·24	1·99	2·50	5·55	...
Blackall	2·30	Nil	2·78	1·69	0·20	0·36	1·36	0·06	Nil	0·88	0·80	7·47	0·63
Brisbane	2·69	5·23	5·32	0·45	4·75	2·91	0·39	0·79	0·10	1·37	4·25	3·21	2·80
Bundaberg	3·29	3·90	12·81	0·38	3·08	4·49	0·87	0·43	Nil	1·70	2·90	2·99	4·77
Caboolture	2·53	8·03	9·04	0·78	3·10	4·98	0·73	0·32	0·13	2·09	4·15	3·18	9·36
Charleville	0·85	Nil	2·75	2·29	0·26	0·90	1·04	0·76	0·02	1·69	3·88	4·09	0·32
Dalby	5·60	1·34	3·72	0·20	2·26	2·35	0·87	0·71	0·15	0 69	5·18	1·44	0·17
Emerald	7·36	3·67	7·66	Nil	Nil	2·53	1·75	0·10	Nil	0·98	1·84	6·70	0·49
Esk	2·87	6·79	3·60	0·22	5·42	2·66	0·54	0·81	0·57	0·50	3·76	3·72	2·61
Gatton Agric. College	2·62	6·44	2·71	Nil	2·80	1·85	0·54	0·56	0·15	0·71	3·01	4·55	...
Gayndah	3·00	1·91	6·89	Nil	2·65	3·00	1·21	0·53	0·40	0·34	4·65	6·84	1·22
Gindie State Farm ...	6·13	0·71	10·10	Nil	Nil	2·29	1·58	0·10	0·16	0·61	1·57	4·42	0·20
Goondiwindi	5·37	1·77	6·51	0·33	1·30	1·09	1·62	0·95	0·12	1·13	2·91	3·71	1·22
Gympie	3·99	6·96	8·93	1·12	3·84	3·77	0·80	0·17	0·47	1·20	3·05	5·49	6·26
Ipswich	2·17	5·38	1·95	0·12	3·43	2·22	0·30	0·43	0·05	0·78	4·45	3·40	1·32
Laidley	2·84	4·50	3·47	Nil	2 99	1·56	0·45	0·58	0·15	0·87	1·97	2·72	1·61
Maryborough	5·52	7·84	10·28	1·25	3·21	6·05	0·64	0·93	0·25	2·74	3·49	5·81	5·62
Nambour	5·74	12·05	13·30	1·36	4·54	6·96	1·08	1·13	0·60	1·38	2·98	4·76	9·29
Nerang	9·86	6·04	7·83	1·48	7·54	5·08	1·26	1·35	0·05	0·86	3·88	4·51	3·83
Roma	6·32	2·92	1·87	0·42	0·27	2·47	1·03	0·42	0·04	1·04	3·70	2·51	0·04
Stanthorpe	4·33	3·30	5·98	1·68	1·79	2·44	1·06	1·65	0·13	1·30	5·03	3·46	0·60
Tambo	4·74	1·41	3·58	3·69	0·11	0·89	1·42	0·09	Nil	0·68	2·03	7·20	0·36
Taroom	5·16	1·10	1·86	Nil	1·01	3·76	0·70	0·04	0·10	0·67	6·82	3·79	0·20
Tewantin	6·38	15·83	11·45	1·87	7·16	7·61	1·48	0·95	0·55	1·05	3·12	7·36	10·42
Texas	4·69	4·55	6·16	0·65	0·93	1·62	1·31	0·87	0·07	1·83	2·78	2·15	1·57
Toowoomba	3·94	4·00	4·81	0·01	4·61	3·34	0·91	0·65	0·17	1·58	5·12	2·81	1·16
Warwick	3·95	2·52	5·71	0·51	1·58	1·27	1·16	1·37	0·01	1·37	3·25	3·13	0·76
Westbrook State Farm	1·79	2·91	5·13	0·02	2·53	2·53	1·04	1·78	Nil	1·08	4·76	3·23	...

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered approximate only.

GEORGE G. BOND,
Divisional Officer.

It will be observed that figures for the following stations have been omitted, viz.:—Kamerunga, Biggenden, Gatton College, and Westbrook. Mr. G. E. Bond, Divisional Officer of the Meteorological Bureau, No. 3 Division, Queensland, says that the reason for this is that, on the 1st of January last, the Queensland Weather Service passed to the control of the Commonwealth Government, and, under the new system, monthly returns of observations are sent direct to the Commonwealth Meteorologist in Melbourne. All the office here has to work upon now is telegraphic information, and no reports by wire are received from the places named. The difficulty has been represented to the Department of Agriculture and Stock, and will, if possible, be overcome as speedily as possible.

Times of Sunrise and Sunset at Brisbane, 1908.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·56	6·45	5·20	6·42	5·41	6·20	5 57	5·46
2	4·57	6·46	5·21	6·42	5·41	6·19	5·58	5·45
3	4·58	6·46	5·22	6·41	5·42	6·18	5·58	5·44
4	4·58	6·46	5·23	6·41	5·43	6·17	5·59	5·43
5	4·59	6·46	5·23	6·40	5·43	6·16	6·0	5·41
6	5·0	6·47	5·24	6·40	5·44	6·15	6·0	5·40
7	5·0	6·47	5·25	6·39	5·44	6·14	6·1	5·39
8	5·1	6·47	5·26	6·38	5·45	6·13	6·1	5·38
9	5·2	6·47	5·26	6·38	5·45	6·11	6·2	5·37
10	5·2	6·47	5·27	6·37	5·46	6 10	6·2	5·36
11	5 3	6·47	5·28	6·36	5·46	6·9	6·3	5·35
12	5·4	6·47	5·29	6·36	5·47	6·8	6·3	5·34
13	5·5	6·47	5·29	6·35	5·47	6·7	6·4	5·33
14	5·6	6·47	5·30	6·34	5·48	6·6	6·4	5·32
15	5·6	6·47	5·31	6·33	5·49	6·5	6·5	5·31
16	5·7	6·47	5·31	6·33	5·49	6·4	6·5	5·30
17	5·8	6·47	5·32	6·32	5·50	6·3	6·6	5·29
18	5·9	6·47	5·33	6·31	5·50	6·2	6·6	5·28
19	5·10	6·47	5·34	6·30	5·51	6·1	6·7	5·27
20	5·10	6·47	5·34	6·29	5·52	5·59	6·7	5·26
21	5·11	6·46	5·35	6·28	5·52	5·58	6·8	5·25
22	5·12	6·46	5·36	6·28	5·53	5·57	6·8	5·24
23	5·13	6·46	5·36	6·27	5·53	5·56	6·9	5·23
24	5·14	6·46	5·37	6·26	5·54	5·55	6·9	5·22
25	5·14	6·45	5·38	6·25	5·54	5 54	6·10	5·21
26	5·15	6·45	5·38	6·24	5·54	5·53	6·11	5·20
27	5·16	6·45	5·39	6·23	5·55	5·52	6·11	5·20
28	5·17	6·44	5·39	6·22	5·55	5·50	6·12	5·19
29	5·18	6·44	5·40	6·21	5·56	5·49	6·12	5·18
30	5·19	6·43	...	...	5·56	5·48	6·13	5·17
31	5·19	6·43	...	...	5·57	5·47	...	...

PHASES OF THE MOON.

			H.	M.	
4 Jan.	●	New Moon	7	43	a.m.
10 ,,	☾	First Quarter	11	53	p.m.
18 ,,	○	Full Moon	11	37	,,
27 ,,	☽	Last Quarter	1	1	a.m.
2 Feb.	●	New Moon	6	36	p.m.
9 ,,	☾	First Quarter	2	27	,,
17 ,,	○	Full Moon	7	5	,,
25 ,,	☽	Last Quarter	1	24	,,
3 Mar.	●	New Moon	4	57	a.m.
10 ,,	☾	First Quarter	7	42	,,
18 ,,	○	Full Moon	0	28	p.m.
25 ,,	☽	Last Quarter	10	32	,,
1 Apr.	●	New Moon	3	2	p.m.
9 ,,	☾	First Quarter	2	32	a.m.
17 ,,	○	Full Moon	2	55	,,
24 ,,	☽	Last Quarter	5	7	,,

Publication Received.

"THE NEW ZEALAND TOWN AND COUNTRY LIFE."

We are in receipt of "New Zealand Town and Country Life," the new issue of the "Farmers' Weekly and Land Agents' Record." Considerable changes have been made in the appearance of the paper, the columns gain an additional 2 inches in depth and another four pages have been added to the paper, which now consists of thirty-six pages and cover. The additional space is largely utilised for the publication of matters of more general interest than are usually found in a paper devoted exclusively to farming matters. Under the heading of "Men Worth Knowing," a very interesting sketch of Sir John Logan Campbell, "The Father of Auckland," appears with a full-page portrait of the veteran-settler in his 91st year, specially taken for the journal. The personal element (always an interesting one) is further catered for under the heading of "In Personal Touch," which deals in anecdotal fashion with the experiences of well-known gentlemen. Under the heading of "The Outlook," matters of current moment are discussed in more or less racy fashion. "Labour's Demands upon the Farmer" are treated editorially under the heading of "The Commonsense View," and other new features of general interest are dealt with in the special columns devoted to the "World of Recreation" and "Mining and Finance." A specially illustrated article gives the reader a peep behind the scenes at the Pollard Juvenile Opera Company, and the Potato Harvest is dealt with in similar fashion. The illustrations are topical in character, and, as all the old farming features of the paper are retained, while the magazine and news sections are considerably strengthened, the paper should gain considerably in support from the reading public.

Answers to Correspondents.

THE COTTON BOUNTY.

JAS. WRIGHT, Don River, Bowen.—

Although the Bounties Bill was passed in the Federal Parliament in November last, no regulations in connection therewith have yet been issued. You may, therefore, either plant cotton next August, by which time regulations will doubtless have been issued, or, if you want the bonus on cotton grown this season, you must await the issue of regulations.

Since the above was written, we learn that the draft regulations have at last been framed. The bounty will be paid on each 2 tons of ginned cotton sent to market. This means that the proprietors of ginning establishments should be able to give a higher price for seed cotton than was paid last year. See the "Brisbane Courier" for 22nd February for further information.

LEAF-BLAST OF SISAL HEMP.

J. HAMILTON, Solomon Islands.—

You need have no fear of the leaf-blast doing permanent injury to a sisal plantation.

About thirty years ago in Mexico a great scare was created by the appearance of what looked like a disease in the leaves of sisal plants. Scientific investigation, however, clearly proved that the red and yellow patches on the leaves were not due to fungoid or insect disease, but to the effects of sudden great heat occurring after long-continued cold rains. When this "leaf-blast" is noticed, the affected leaves should be at once put through the decorticating machine, as the fibre is not injured. The leaf-blast has occurred in the Brisbane Botanic Gardens, at St. Helena, at Peel Island, and also in the North during the past year. At St. Helena the fibre-extracting machines were at work, so that no loss was sustained. The blast disappeared almost as rapidly as it had shown itself, and the health of the plants was not in the least injured. It is noticeable that the leaf-blast is liable to occur at very long intervals, where the plants are growing in rich soil. Those planted on poor and rocky soils gave no indication of the trouble. Intending planters need not hesitate to plant suckers on which the leaf-blast is visible, as it will not affect the growth or health of the plants in the least.

GROWING SWEET POTATOES.

F. LEISHMAN, Blackall Range.—

It is almost incredible that, after over fifty years' experience in growing sweet potatoes, there should yet be doubt as to the method of planting in order to obtain the best result. The usually adopted plan is to throw up the land in ridges about 4 feet apart from centre to centre. The crown of the ridge is opened, and cuttings from the vines are planted in the furrow. These cuttings may be from 10 to 12 inches in length. They soon take root, and, before long, cover the whole intervening spaces with a mass of runners. But it sometimes happens that the luxuriant growth of vines is produced at the expense of the tubers. This trouble is easily avoided by cutting back the vines and hilling up the drills afresh, or by twisting up the vines in a heap on top of the roots. Another plan is to turn the vines over from one side to the other of the row about once a fortnight. By so doing, all the tubers become fully developed.

SEED CORN.

M. REED, Warra.—

It has always been the custom with maize-growers to select the large flat grains for seed. There can be no doubt that if the round grains are sown the crop will turn out a poor one—the cobs produced on plants grown from such seed will never fill out properly. There is, however, one point in connection with seed corn which is perhaps not generally known, and that is, that the largest grains do not necessarily produce the largest plants. The size of the germ within the seed bears no relation to the size of the grain. Of course, it can well be understood that the larger the seed the more food material there is to enable the plant to resist adverse influences, and to enable the embryo plant to push its way up from a depth which would be fatal to a weaker germ. Small seeds often contain larger and stronger germs than large seeds.

DISEASE IN POULTRY.

POULTRY FARMER, Kinkora.—

Mr. M. Fern, Instructor in Poultry Breeding to the Department of Agriculture and Stock, gives the following opinion concerning the trouble with your poultry, based on the symptoms you describe:—

From the few particulars forwarded, I should say your birds are suffering from debility or anaemia, and when in such a condition fall a prey to any disease that may be going about The cause is very hard to define. It may be from want of air or sunshine, errors in feeding, inbreeding, or hereditary.

Treatment: Find the cause and remove it. Isolate all sick birds, and destroy same, as they will be useless as breeders. Remove droppings regularly; allow sun to penetrate the houses; provide clean cool drinking water—a tonic in the form of a little tincture of iron in drinking water, a teaspoonful to a quart of water.

We should be glad if you could forward a bird (alive) suffering as you describe. It is very hard to say definitely what disease a bird is suffering unless full particulars are given of mode of feeding and other particulars that escape the ordinary observer. By an examination of the bird a diagnosis of the disease would be more certain.

SOOT AS A MANURE.

F. W. IRONMONGER, Pine Mountain.—

In reply to your question, Mr. J. C. Brünnich, Agricultural Chemist, says:—

Soot has a manurial value on account of containing about 3 per cent. of nitrogen, and also small amounts of potash and phosphoric acid. It may be used as a top dressing for grass and grain crops.

Boiler flue ashes have also a manurial value, as they contain appreciable amounts of potash and lime, varying in accordance with the kind of fuel burnt.

Basic slag or Thomas phosphate is a by-product of steel works, and is valuable as manure on account of the large amount of phosphoric acid it contains combined with lime. The phosphoric acid is not in so soluble a form as in superphosphate, but still is readily available. It may be applied at the rate of 1 to 3 cwt. per acre.

TREATMENT OF MOTHERLESS FOAL.

S.C., Sandy Creek, Mackay.—

(1) Cow's milk, with the addition of rain water in the proportion of 9 parts of milk to 1 of water, is the best food on which to rear a foal artificially. The animal should be fed three or four times a day. Care should be taken that the milk is fresh, that the cows supplying it are healthy, and that the vessels containing it are thoroughly clean.

(2) *Light Manures.*—Yes, the address given is sufficient.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JANUARY. Prices.
Apples, Imported, per packer	18s. 6d.
Apples, New England, per packer	4s. to 10s.
Apples, Tasmanian, Cooking	...
Apricots, Local, per packer	...
Bananas, Fiji, per case	13s. to 13s. 6d.
Bananas, Fiji, per bunch	3s. 6d. to 7s.
Bananas, Queensland, per case	12s. to 13s.
Bananas, Queensland, per bunch...	2s. 6d. to 5s.
Cherries, per quarter-case...	...
Cocoanuts, per bag	11s. to 12s. 6d.
Custard Apples, per quarter-case	6s. to 7s.
Grapes (black), per box	1s. 6d. to 4s.
Grapes (white), per box	1s. to 3s. 6d.
Grapes (muscatel), per box	3s. to 7s.
Lemons (white)	3s. to 10s.
Mangoes, Queensland, per packer	5s. to 6s.
Nectarines, per box	2s. 6d. to 10s.
Oranges, Imported, per case	22s. 6d.
Passion Fruit (Local), choice, per half-case	4s. 6d. to 5s.
Passion Fruit, medium, per half-case	3s. to 3s. 6d.
Passion Fruit, small, per half-case	1s. 6d. to 2s. 6d.
Pears, per quarter-case	10s. to 12s.
Peaches, per quarter-case	3s. to 5s.
Peanuts, per lb.	...
Persimmons, per case	...
Pineapples (Queensland), Queen, per case	5s. to 6s. 6d.
Pineapples, common, choice, per case	3s. 6d. to 4s. 6d.
Pineapples, medium, per case	2s. 6d. to 3s.
Rockmelons, Local, per gin case	4s. to 5s. 6d.
Tomatoes, Local, per box	2s. 6d. to 4s. 6d.
Watermelons, Local (large), per dozen	7s. to 9s.
Watermelons (medium), per dozen	5s. to 6s.
Watermelons (small), per dozen	3s. to 4s.
SOUTHERN FRUIT MARKET.	
Bananas, Fiji, per case	10s. 6d. to 11s. 6d.
„ „ per bunch	3s. to 3s. 6d.
„ Queensland, per case	9s. 6d. to 10s.
„ „ per bunch...	2s. 6d. to 5s.
Cocoanuts, per bag...	11s. to 12s. 6d.
Lemons (choice coloured), per case	10s. to 12s.
„ (good), per gin case	7s. to 8s.
„ (rough), per gin case	4s. to 5s.
„ (Italian), per case	12s. to 13.
„ (American), per case	17s. 6d.
Mangoes, Queensland, per case	5s. to 6s.
Oranges, Italian, per case	21s.
Oranges, Washington Navel, per case	16s. to 18s.
Oranges, common, choice, per case	3s. 6d. to 4s.
Oranges, medium, per case	2s. 6d. to 3s.
Passion Fruit, per quarter-case	4s.
Pineapples, Queensland (Queens)	5s. to 6s. 6d.
Peanuts, per quarter-case	11d. to 1s.
Rockmelons, per double case	5s. to 6s.
Tomatoes, per quarter-case	3s. to 5s.
Watermelons, Queensland, per dozen	8s. to 10s.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY.

Article.		FEBRUARY. Prices.
Bacon, Pineapple	lb.	9½d.
Bran	ton	£5 to £5 15s.
Butter, Factory	lb.	1s. 1d.
Chaff, Mixed	ton	£6.
Chaff, Oaten	,,	£6 to £6 15s.
Chaff, Lucerne	,,	£4 to £4 15s.
Chaff, Wheaten	,,	£4 10s. to £5 10s.
Cheese	lb.	10½d.
Flour	ton	£10 15s.
Hay, Oaten	,,	£7 5s. to £7 15s.
Hay, Lucerne	,,	£3 15s. to £4 5s.
Honey	lb.	2½d. to 2¾d.
Maize	bush.	4s. 3d. to 4s. 9d.
Oats	,,	3s. 7d. to 3s. 9d.
Pollard	ton	£7 10s. to £7 15s.
Potatoes	,,	£8 to £10 10s.
Potatoes, Sweet	,,	...
Pumpkins	,,	...
Wheat, Milling	bush.	...
Wheat, Chick	,,	4s. 9d. to 5s. 6d.
Onions	ton	£8 10s. to £9.
Hams	lb.	10d. to 1s.
Eggs	doz.	9d. to 1s. 3d.
Fowls	pair	2s. to 3s.
Geese	,,	5s. 6d. to 6s. 3d.
Ducks, English	,,	2s. 6d. to 3s. 2d.
Ducks, Muscovy	,,	3s. 6d.
Turkeys (Hens)	,,	6s. to 8s. 3d.
Turkeys (Gobblers)	,,	10s. to 17s.

ENOGGERA SALEYARDS.

Animal.	JANUARY. Prices.
Bullocks	£10 2s. 6d. to £11 7s. 6d.
Cows	£6 10s. to £9 7s. 6d.
Merino Wethers (Shorn)	17s. 3d.
C.B. ,, ,,	19s. 6d.
Merino Ewes ,,	17s. 9d.
C.B. ,, ,,	18s.
Shropshire Ewes	20s.
Lambs	14s. 9d.

Orchard Notes for April.

By ALBERT H. BENSON, M.R.A.C.

The Southern Coast Districts.

The gathering and marketing of citrus fruit, as well as of pines, bananas, custard apples, persimmons, &c., is the principal work of the month. In the Notes for March I drew attention to the necessity for keeping all pests in check, particularly those attacking the ripening fruit. As it is the height of folly to look after the orchard thoroughly during the growing period of the crop and then to neglect the crop when grown, every possible care must be taken to keep fruit fly, peach moth, black brand, or other pests that destroy or disfigure the fruit in check, and this can only be accomplished by combined and systematic action. Citrus fruit at this time of the year often carries badly, as the stem is tender, easily bruised, full of moisture, and, consequently, very liable to the attacks of the blue mould fungus, which causes specking. The loss from this cause can be lessened to a considerable extent by carefully attending to the following particulars:—

1st. Never allow mouldy fruit to hang on the trees or to lie about on the ground. It should be gathered and destroyed, so that the countless spores which are produced by the fungus shall not be distributed broadcast throughout the orchard, infesting many fruit, and only waiting for a favourable opportunity, such as an injury to the skin by an insect or otherwise, combined with favourable weather conditions (heat and moisture), to start into growth.

2nd. Handle the fruit carefully to prevent bruising. Cut the fruit, don't pull it, as pulling is apt to plug the fruit—that is to say, to either pull the stem out or injure the skin round the stem—and a fruit so injured will go mouldy.

3rd. Sweat or dry the fruit thoroughly; if the weather is humid, laying the fruit out in the sun on boards or slabs is a very good plan.

4th. After sweating, examine the fruit carefully, and cull out all bruised or punctured fruit, and only pack perfectly sound dry fruit. It is better for the loss to take place in the orchard than for the loss to take place in the case in transit.

5th. If the mould is very bad, try dipping the fruit for a few seconds in a 2 per cent. solution of formalin. This will kill the spores, and if the fruit is placed in the sun and dried quickly before packing there will not be much chance of its becoming reinfested.

Don't gather the fruit too green, especially such varieties as the Beauty of Glen Retreat Mandarins, as immature fruit spoils the sale of the good article.

If the orchard has not been cleaned up after the summer rains, do so now; and do any other odd jobs that may be required, such as mending fences, grubbing out dead or worthless trees, cleaning out drains, &c.

Strawberry planting may be continued, and where new orchards are to be planted continue to work the soil so as to get it into the best possible tilth.

Tropical Coast Districts.

Clean up the orchards after the rainy season. Look out for scale insects, and cyanide or spray for same when necessary.

Go over the trees carefully, and when there is dead wood or water sprouts remove them. If bark fungus is showing, paint the affected branches with the sulphur and lime wash. Clean up bananas, pineapples, and other fruits, as after the end of the month it is probable that there will not be any great rainfall, so that it is advisable to keep the ground well cultivated and free from weeds, so as to retain in the soil the moisture required for the trees' use during the winter months. Keep bananas netted; destroy guavas wherever found.

SOUTHERN AND CENTRAL TABLELANDS.

If the orchards and vineyards have not already been cleaned up, do so. Cultivate or plough the orchard, so as to get the surface soil into good tilth, so that it can absorb and retain any rain that falls, as, even though the trees will simply be hardening off their summer's growth of wood, it is not advisable to let the ground dry out. Where citrus fruits are grown, attend to them in the manner recommended for the Southern Coast Districts; and when grown in the dry parts, keep the land in a state of good cultivation. Should the trees require it, a light watering may be given. Do not irrigate vines; let them ripen off their wood.

Farm and Garden Notes for April.

FIELD.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will now be ready for a first or second hilling up. The last of the maize crop will now have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and Swede turnips. Plant out paspalum roots. Seed wheat of whatever variety soever should be dipped in a solution of sulphate of copper (bluestone) in the proportion of 1 lb. of sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against bunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin costs about 2s. 10d. per lb., and is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediate

use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient—more on poor land and less on rich soils. On light sandy soil the wheat should be rolled. On sticky land it should only be rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 inches high go over it with light harrows. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

Kitchen Garden.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

Flower Garden.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camelias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants such as verbenas, petunias, penstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March.

Agriculture.

VEGETABLE MATTER IN WOOL.

We are indebted to the courtesy of Mr. J. Macdonald, manager of the New Zealand Loan and Mercantile Agency Company, Limited, Brisbane, for the following information on the above subject, contained in a leaflet issued by an influential committee of representatives of the wool-growers of Australia, New Zealand, the London Selling Brokers, the Colonial Wool Merchants' Association, Bradford Top-makers, Spinners, &c., the German Combers' Association, the Roubaix Chamber of Commerce, and the Wool Buyers' Association. The chairman of the committee is Mr. J. E. Fawcett, Lord Mayor of Bradford:—

VEGETABLE MATTER IN WOOL.—A VAST EVIL AND ITS REMEDY

(Issued by the above Committee.)

An influential meeting of Australian and New Zealand wool-growers, British and Continental consumers and wool-brokers was held on 2nd October, 1907, at the offices of Messrs. Dalgety and Co., Limited, Bishopsgate street, London, to consider complaints from the manufacturing users of wool in Europe and America of the presence of vegetable fibres in wool imported from Australasia and other wool-growing countries, and, if possible, to devise means to remedy the evil.

The nature of the evil was explained. Small bits of bagging and string become mixed up with the wool, and, though the utmost care be taken in the "sorting" to pick these out, some of them pass with the wool through the washing process, and so through the combing, spinning, and weaving, because these fibres are then quite indistinguishable by the naked eye. When the manufactured cloth comes to be dyed, the presence of these vegetable fibres instantly declares itself, because wool, being an animal fibre, "takes the dye," while these vegetable fibres remain white or nearly so. Such goods are imperfect, and in that condition quite unmerchantable. Often there is not a single yard of the cloth without its blemish.

[Note.—Some dyes used for vegetable substances, as cotton, linen, are not suited for wool and conversely.]

To remove these defects is an exceedingly slow, laborious, and costly process. Every such fibre must be patiently picked out of the woven piece by the deft fingers of the "burler," it being impossible to detect the jute fibres in any previous operation. The utmost care must be used not to injure the cloth. It is an operation which is most trying to the eyes and calling for great skill. Some firms pay many thousands of pounds annually in wages to "burlers," as the women are called who do this work. If these fibres could be kept out of the wool in the first instance, this heavy annual tax upon the industry would almost cease.

If the manufacturer who suffers in this way were himself the purchaser of the wool, he would undoubtedly long since have found a remedy by enforcing reform. But the trade is now so specialised that it would be impossible to trace back the wool to its source. The buying agent, the top-maker or importer, the comber, the spinner, all handle and blend and mix the wool before it comes into the hands of the manufacturer as yarn. Even manufacturers who perform all

the operations themselves cannot escape, and, as explained above, the defects are not visible until the mischief is done. Hence the absolute necessity for dealing with the evil so that it may be attacked at its source.

HOW THE MISCHIEF IS CAUSED.

Vegetable substances which are found at various times, under varying conditions and in greatly varying quantities, may be divided into two classes:—

(1) Vegetable substances in their natural state, such as burrs, grass seeds, thorns.

(2) Vegetable fibres in more or less artificial association.

With regard to the first class, it may be stated that many ingenious and costly mechanical devices have been invented to get rid of these things. The Yorkshire Woolcombers' Association, Limited, paid £60,000 to a French syndicate for the English patent rights of a process for de-burring wool; and many times this sum has been spent in the same quest. The most effective method is to "carbonise" or "extract" such substances by the use of acids. This, however, inevitably *injures* and *deteriorates* the *wool fibre* itself. In practice it is only applied to such wools as are "full of burr" or seed. It is a process not to be seriously contemplated in connection with the better class of wools—the combing wools which fetch the highest prices; hence the great pains and cost incurred to get rid of these substances by mechanical means.

The second class of fibres find their way into the wool by man's assistance. They are equally, nay, even more detrimental and more difficult to eliminate. They are usually either jute, hemp, or cotton. They are found as—

- Pieces of bagging.
- Pieces of rope or twine used in tying fleeces.
- Pieces of sewing twine.
- Shreds of bagging, twine, &c., more or less abraded, which have been gathered up from the floor of the shearing-shed, the warehouse, or the quayside with wool which has been pulled out for sampling or has escaped through damage to the tare.

These fibres are more difficult to deal with, because:—

- They are often too minute to be seen except by the aid of a magnifying glass;
- They are especially, if unravelled, often not unlike greasy or dirty wool in colour;
- They are frequently so numerous, and so distributed over the surface of the wool when the bale is first opened, that it would be practically impossible at whatever cost of time or labour to pick them all out;
- When, after the wool has been "sorted," it goes through the process of washing, the fibres become softened, detached one from another, and are bleached as white as the wool itself, so that they cannot again in any subsequent process be readily detected by the eye;
- Being straight, fine fibres, they behave like the wool fibres, and are ultimately spun into yarn with the wool.

The most careful investigation has shown that the great bulk of the mischief is traceable directly or indirectly to the unsuitable character of the wool-pack in common use in the colonies.

This pack is of jute, and the quality has steadily deteriorated for many years. But the deterioration has been more pronounced since the price of jute began to advance. A shorter fibre is now used, and the bagging is not so hard

or "clean" as it used to be—it is more "fuzzy." If a new pack be rubbed against the sleeve of a dark cloth coat, it will at once be seen that a number of fibres have come off the bag and are sticking to the coat. When a bale of wool is opened, it is found that the surface of the wool, which for three, six, or nine months has been in close contact with the tare, is frequently covered with thousands of such particles of jute fibre.

Whenever and wherever the pack is cut the material of which it is made frays, little bits come off, and stick to the wool.

Remedies for the Evil.

First and foremost the general adoption of a wool-pack of such a character that it will not depreciate the value of the wool it contains. The committee are pursuing inquiries in regard to the provision of a better bag. They hope shortly to be able to give further information, and to recommend an improved wool-pack and sewing twine for general use.

The adoption of such a standard pack, made of good, clean, hard twisted jute or hemp yarn, carefully sewn so that the pack does not need to be "cut down" at the corners in the baling press, and provided with a separate piece of canvas for the top of the bale, would do a vast deal to mitigate the evil.

The systematic emptying of the pack before it is put into the press. It is found that frequently bits of the canvas and ends of sewing twine come inside the new packs from the factory. Care should be taken to see that these are shaken out.

In the shearing-shed, in the classing and packing of wool, the utmost care should be used to prevent loose bits of twine, rope, or bagging coming near the wool, or being swept up with wool from the floor.

The tying of fleeces ought to be avoided entirely.

All straw &c., should be carefully removed from the shearing place before shearing commences.

In stores and warehouses where bales are exposed for sampling, the necessary opening of the tare should be done so as to damage it as little as possible. Bales should be opened at the seams by cutting the sewing twine, and all frayed edges and loose bits should be removed and destroyed.

It is recommended that printed cards should be provided for hanging in shearing-sheds and warehouses in the following terms:—

For Shearing-sheds.

1. All straw, &c., should be carefully removed from the shearing-shed before actual shearing is begun.
2. Turn out each bag before packing the wool, and see that it is clean and free from bits of hemp.
3. Loose bits of twine, bagging, or straw should be carefully kept apart from the wool.

For Warehouses.

1. All bales must be opened at the seams only, by cutting the blue twine.
2. Any frayed edges or loose pieces of string should be removed carefully and at once by men whose special care it is to watch the wools when "on show."
3. Warehouse "pullings" should be carefully looked over before being restored to the bales.

THE JACKSON POTATO-DIGGER.

We have received many inquiries from farmers concerning the newly invented potato-digger. All we are in a position to say about it is that at the trials its work was done most satisfactorily, all the potatoes being brought to the surface. The machine does not grade. For information as to price, or whether already procurable in the Southern States, we must ask our readers and other inquirers to communicate direct with Mr. Jackson, Taringa, near Brisbane.

MANURING EXPERIMENTS WITH POTATOES.

The experiments were carried out by Mr. Andrew Bell, at Strathpine, under the supervision of officers of the Department of Agriculture and Stock, and the results of the crop gave a good financial result and good return for the manure, although in both seasons the crop was much affected by blight, and was consequently light.

The soil of the experimental plots is a grey sandy loam, with sandy subsoil, and the land, originally scrub land, was cleared about ten years ago, and was chiefly under maize and potatoes. According to analysis the soil contains:—

	Agricultural Analysis. Sol. in HCl.	Available Plant Food. Sol. in Citric Acid.
Total nitrogen ...	·140 per cent.	...
Phosphoric acid ...	·091 ,,	·024 per cent.
Potash	·271 ,,	·012 ,,
Lime	·800 ,,	... ,,

Each of the plots of one-tenth of an acre area had six drills 3 feet apart with 4 feet between the plots. The first crop was harvested in January, 1907; the crop was good, but had suffered from blight, and Mr. Bell estimates the loss by blight at least as one-third of crop. The results of the plots showed the necessity of a general manure with a liberal supply of potash. The return of the plots, and particularly plot 6, was very satisfactory.

The second crop was planted in July, 1907, and harvested in December, 1907. The rainfall during the six months was as follows:—June, 2·76 in.; July, ·50; August, ·60; September, ·24; October, ·96; and November, 4·39. The heaviest shower after planting was only 18 points, and the good rains in November came too late to benefit the crop. The plots with ammonium sulphate made a much quicker growth of tops than with nitrates. Kainite gave good crops of good quality, and gave the best result in connection with Thomas' phosphate in plot No. 4. The poor result of the heavily manured plot No. 6 must be attributed to the dry season and to the fact that the land towards this end of the field is rather lighter and sandier.

As the crop was affected by blight for several years running, the land should be put under other crops for at least one year before potatoes are grown again.

No. of Experiment in each $\frac{1}{10}$-acre.	FIRST EXPERIMENTAL POTATO CROP, 1906. Detail of Manuring per Acre— Lb.	Crop of Potatoes. Per Plot in— Cwt. qr. lb.	Crop of Potatoes. Per Acre in— Tons.	Remarks on Growth by Mr. Bell.	SECOND EXPERIMENTAL POTATO CROP, 1907. Details of Manuring per Acre in— Lb.	Cost of Manure per Acre in Shillings.	Crop of Potatoes. Per Plot in— Cwt. qr. lb.	Crop of Potatoes. Per Acre in— Tons.	Remarks on Growth by Mr. Bell.
1	Unmanured	Large 3 1 26 Small 0 2 4	2·01	Crop poor and very blighted	36 P_2O_5 as 2 cwt. superphosphate 15·5 N as 1 cwt. nitrate of soda 26 K_2O as 2 cwt. kainite	42/-	Large 4 1 4 Small 1 1 0	2·27	Fair crop, but blighted
2	36 P_2O_5 as 2 cwt. superphosphate 10 N as $\frac{1}{2}$ cwt. ammon. sulphate — K_2O	Large 3 3 2 Small 0 1 18	2·09	Very much blighted	36 P_2O_5 as 2 cwt. Thomas phosphate 20 N as 1 cwt. ammon. sulphate 52 K_2O as 1 cwt. potassium sulphate	45/-	Large 4 0 12 Small 0 2 24	2·41	Very large clean potatoes, but suffered much from blight
3	36 P_2O_5 as 2 cwt. superphosphate — N 26 K_2O as $\frac{1}{2}$ cwt. potassium sulphate	Large 4 3 4 Small 1 0 20	2·98	Nice potatoes and fair crop, but also blighted	36 P_2O_5 as 2 cwt. superphosphate 15·5 N as 1 cwt. nitrate of soda 26 K_2O as $\frac{1}{2}$ cwt. potassium sulphate	40/-	Large 4 2 4 Small 1 0 16	2·84	Large loss by blight
	— P_2O_5 ... ... 10 N as $\frac{1}{2}$ cwt. ammon. sulphate 26 K_2O as $\frac{1}{2}$ cwt. potassium sulphate	Large 3 1 16 Small 1 0 21	2·29	Nearly half of the crop was killed by blight	54 P_2O_5 as 3 cwt. Thomas phosphate 15·5 N as 1 cwt. nitrate of soda 26 K_2O as 2 cwt. kainite	43/6	Large 5 0 4 Small 1 0 13	3·08	The best from start, but lost like others heavily from blight
5	36 P_2O_5 as 2 cwt. superphosphate 10 N as $\frac{1}{2}$ cwt. ammon. sulphate 26 K_2O as $\frac{1}{2}$ cwt. potassium sulphate	Large 5 3 16 Small 0 1 12	3·12	Did not suffer quite so much from blight	36 P_2O_5 as 2 cwt. superphosphate 10 N as $\frac{1}{2}$ cwt. ammon. sulphate 26 K_2O as $\frac{1}{2}$ cwt. potassium sulphate	32/-	Large 3 1 5 Small 0 2 17	1·97	Very large tops from start, but want of rain checked the growth
6	72 P_2O_5 as 4 cwt. superphosphate 20 N as 1 cwt. ammon. sulphate 52 K_2O as 1 cwt. potassium sulphate	Large 7 1 2 Small 0 3 0	4·01	Gave fine large potatoes, and but for blight should have yielded 5 tons per acre	54 P_2O_5 as 3 cwt. superphosphate 30 N as $1\frac{1}{2}$ cwt. ammon. sulphate 104 K_2O as 2 cwt. potassium sulphate	81/6	Large 4 1 6 Small 1 0 24	2·76	This plot made very good growth, and was the best looking of all, but suffered more from blight and dry weather
7	CaO as 20 cwt. lime ...	Large 5 0 6 Small 0 2 0	2·78	About $\frac{1}{2}$ cwt. of potatoes destroyed by fly	20 cwt. lime and one-half of plot same manure as No. 5	...	Large 2 1 4 Small 0 3 12	1·57	This heavily limed land was as dry as an ash-bed, the soil is rather too sandy

Dairying.

DAIRYING INDUSTRY.

COMPREHENSIVE REPORT—*continued.*

By G. SUTHERLAND THOMSON, Government Dairy Expert.

FACTORIES AND THE BUTTER BRANDS.

In this report it has been pointed out what an injurious influence the competition for cream has exercised on the general quality of butter and the uniformity of factory grades. I may be pardoned for again drawing the reader's attention to the payment of fictitious prices for cream by some factories; and, with a view of capturing the cream supply, evil influences have been introduced into dairying, and the advance of the industry has met with considerable opposition. As practically no distinction was made in the prices offered for superfine cream and pastry cream by the factories engaged in the bitter struggle for supremacy over the producer, managers were virtually compelled to blend the choice and bad creams to an extent that practically ruined the reputation of their first-class brands in the open market. It was naturally the earnest desire of every responsible factory employee to turn out as many boxes of first-class butter as possible to avert financial disaster to the factory, a fate which some of them narrowly escaped. It thus followed that much of the butter that was stamped first-class obtained the bare pass marks for that distinction—90 per cent.—instead of scoring a high first grade—94 per cent. What did this practice which the managers were forced to adopt result in? Very large consignments of butter, which the factory managers believed would scrape through as first grade, failed to score the necessary points, and were passed into a lower grade, perhaps as high seconds—88 per cent. or 89 per cent. Quantities of this butter may have sampled well the day after churning, thereby deceiving the manager, but the flavour of produce of this kind should not be relied upon by any butter-maker when the fact was known that the churnings were made up of different grades of cream. But satisfactory grading of cream could not be carried out by the factories, as the buildings were not equipped with the necessary ripening vats to treat cream of more than one quality, and in many cases this condition still prevails. Yet we have had to listen to the anti-grader's praises of the factory appliances, which, in his opinion, did "the deed" by lifting the dairying industry of Queensland into prominence.

To prove the utter unpreparedness of factories to comply with the Commerce Act in the number of grades of butter, of which there are five—namely, First Class Superfine, First Class, Second Class, Third Class, and Pastry—I shall give a summary of the number of brands used by our factories.

Out of 47 factories actively engaged in the export butter trade, 20 have 1 brand, 19 have 2 brands, 6 have 3 brands, and only 1 has 4 brands in use.

From these figures the producer will recognise how very badly prepared the factories were to ship brands of butter of a reliable quality, and I again ask the farmer to consider the result to himself had the Department of Agriculture paid no heed to the official inspection of dairy exports, as desired by the anti-grader. To justify the firm stand I took against the combined efforts of exporters, brokers, and factories to abolish grading and marking of boxes, I give the following extract from a letter received by a Queensland firm from a

representative of different sections of the produce trade of Great Britain, which is dated 22nd January:—

"*Grading.*—You were quite right not to sign the petition. We have observed that several agents had done so, doubtless in order to curry favour with the shipper; but certainly the Government ought not to recede from the position already taken up by them. It would be a sad mistake, and a retrograde movement. We have not the slightest hesitation in saying that the C.I.F. business would be ruined if grading were not enforced and rigidly adhered to, and nothing has helped business in Queensland butter more than the knowledge that grading is compulsory, and is rigidly carried out. Even second grades are now so well defined that we can sell them readily on C.I.F. terms, a thing which would be utterly impossible if it were not for the guarantee of the Government grader. From our point of view, therefore, the system is equally beneficial to your makers (as it gives them the choice of the local or English market) and to ourselves, as it enables us to operate with confidence to ourselves and our buyers in your market."

What appears above are the views of a responsible firm, and I may say the same opinions have been expressed to me in writing by numerous merchants in Great Britain, and by the leading daily and agricultural papers throughout Australia. My own experience amply confirms all that has been put forth by responsible parties in support of the compulsory inspection of dairy produce.

The writer of the extract just referred to mentions the fact (although not well established in Queensland is finding sympathy) that second grades of butter are being more thoroughly appreciated than previously. This is directly attributed to the greater confidence the home trade are showing in the genuineness of the article. This is reiterated in the following notice, which appeared in the Brisbane "Courier" of 4th March:—

"The Wide Bay Co-operative Butter Company have received word that a consignment of 200 boxes of second-grade butter brought 148s. on the London market, a record for second-grade butter."

Churning Number and the Vat.

As a good deal of support has been claimed for the vat theory in resenting the classification of butter, I might take this opportunity to point out the bad wisdom of adhering to this argument. It is claimed that butter made from a vat of cream is of the same quality, or, in other words, the churnings are identical in flavour, &c. This is not the case, as the experience of every buttermaker in Queensland has shown. Four churnings may be made from a vat of cream, and the time between each churning may be sufficient to practically ruin the flavour of the last churning, unless the churnings are done in rapid succession. When cream is fast in acid development and not absolutely sound, a couple of hours between a churning is sufficient to change the grade of butter from a first to a second.

Grading of Butter.

Messrs. W. Weddell and Co., in their "Colonial Dairy Produce Review" for the year ending 30th June, 1907, write as follows:—

"When the New Zealand Government some years ago instituted the compulsory grading of butter, and the prohibition of the export of all butter unless each box bore upon it the particular grade of the butter it contained, a very great interference with private enterprise was introduced; but the practical success of compulsory grading has amply justified its introduction. At that time Australia butter held the premier and New Zealand the secondary position for colonial butter in British markets. To-day the positions are reversed, and this change is mainly, if not entirely, due to the adoption of compulsory grading. There are certain factories in Australia, it is true, where grading is not compulsory, which now make butter equal in quality to the best

New Zealand; but it is only in very few cases that this happens. The great bulk of the New Zealand surpasses Australian, and brings a price higher by 2s. to 4s. per cwt.

"Some of the Australian States have lately adopted compulsory grading with satisfactory results which augur well for the future, but this reform is too recent to have yet produced any great change in quality or price. The subject, however, is a burning one, and in all probability before long grading will be compulsory throughout the Commonwealth. Its opponents in Australia, while admitting the superior quality generally of New Zealand butter, allege that the cooler climate is the cause of the better quality. They overlook the fact that this has not changed since grading began; and also that some of the very best butter in New Zealand and in the State of New South Wales is made in their hottest districts—viz., Auckland and the North Coast. It is almost universally admitted in Australia that compulsory grading improves the quality, because it stimulates factories to make an article to surpass that of their neighbours; but there is a reluctance among certain of the best factories to acknowledge the value of grading when butter is consigned to British markets for sale, where, it is alleged, and alleged truly, that the butter is bought on its intrinsic quality at the time of purchase and not on its grading quality before it is shipped from Australia. Again, opponents overlook the fact that as grading induces a healthy rivalry among the factories it must bring into existence a better all-round article, which, in turn, will command a higher range of prices for the entire output of the colony when it reaches British markets.

"One of the great advantages that grading has conferred upon New Zealand is this: It has brought about a regular standard of quality, and on the strength of the standard New Zealand has the advantage of two markets—one for 'forward' sales, and the other for sale on consignment. This selection of markets is of the utmost value. For example, last year, when record high prices were offered for 'forward' sales by British buyers, New Zealand grasped the opportunity and sold on this basis above 90 per cent. of the output at prices about £10 per ton over that sold on consignment. Australia, owing to the prevailing lack of grading, had virtually only the consignment market in which to sell. Selling 'forward' is not always the most profitable market, but those who, by reliable grading, have put themselves in a position to sell 'forward' are enabled to select which market they consider will pay them best. In Australia 'forward' selling is objected to by some on the ground that it is gambling with the future, but surely it is equally gambling with the future to ship on consignment in a distant market for sale on consignment.

"To secure the advantages of the 'forward' market, the chief essential is the establishment of a fixed and permanent standard of quality. Whether the standard in one State be higher or lower than that in another matters little, so long as the person buying 'forward' knows exactly what he is buying. Successful trading cannot exist when the purchaser is uncertain of the quality of the article he proposes to purchase.

"It was this uncertainty which caused the Home and Foreign Produce Exchange in London this year to rescind the rule in butter and cheese contracts which made the graders' certificate final as to quality. Unfortunately, the rescinded rule included New Zealand butter, against the grading of which only a very small percentage of buyers take any exception, and endeavours will be made at the first opportunity to restore the rule so far as New Zealand is concerned, and to frame a suitable rule to meet the case of Australia."

C.I.F. TERMS.

Every reader may not be conversant with the above abbreviations, and a brief explanation may be acceptable. In the butter business, and the same may apply to other departments of the export produce trade, occasions arise when butter is bought at the port of shipment at a stipulated price for the different

grades or qualities contained in a shipment. As the buyer in England, South Africa, or some other country is at the mercy of the seller, he takes advantage of the Government classification of the produce and pays according to it—First, Second, Third grade, as the case may be. Under these conditions, would it be wise to put a certificate number on the boxes instead of the grade distinction? I should think not; and, were the grading of butter withdrawn, C.I.F. terms, which is one of the privileges of a legitimate trading between two countries would quickly disappear. And here I might be forgiven for stating that some members of the export trade of Queensland, who enjoyed to the fullest possible extent the profits of C.I.F. terms last season, turned bitterly against grading at the close of the season. Never again are they likely to enjoy the same courtesy, consideration, and perhaps leniency in the grading of their produce, and doubtless their uncalled-for attitude generated in the more rigid inspection of their exports, which is now being enforced with credit to the producers of Queensland.

ERRORS IN THE COMMONWEALTH SYSTEM OF GRADING.

When the Commonwealth scale of points for use in the classification of export butter was first enforced, errors arose through the grade being decided on the total award for points. It thus followed that if a butter was awarded 50 points for texture, colour, &c., and 36 out of a total of 50 for flavour, the product was entitled to the first-class official stamp. At this same period Queensland was grading practically on flavour, and the requirements for flavour for each grade were as follows:—

First class	46 to 50
Second class	41 to 45
Third class	37 to 40

Before leaving for England in September, 1906, I made a suggestion for a meeting of Government dairy experts to give consideration to subjects of particular interest to all the States, but no conference was held until after my departure when it was decided to alter the scale of points and introduce into the new scale the principle of the Queensland system. The present scale, although an improvement on the first, gives too wide a range of points for superfine and first-grade classes of butter.

Personally, I should like to have seen the superfine grade omitted for a few years at least, as my experience of Australian produce in Great Britain proved that the reputation of the grade was in danger, and the writer's recent investigations into the keeping properties of butter at different temperatures confirms this view.

GRADE MARKS *VERSUS* CERTIFICATE NUMBERS.

The practice of marking the grade on butter that is classed superfine or first grade and omitting the stamping of the lower grades is, in the opinion of the writer, unfair to the principle of grading. It has been fully demonstrated that a butter, graded superfine, may develop fishiness in cool storage, and arrive in London a lower grade. Again, a trace of a stale flavour may be found in butter that has been stamped first class—perhaps a low first a day or two after it has been graded. If this quality of butter is not kept at a very low temperature, it will likewise deteriorate. After consideration of this and other points which have an important bearing on the value of butter grading, it illustrates that great care should have been taken before the superfine grade was introduced, so that the dangers operating against its success may have been avoided.

There is much to say in favour of marking low grades of butter, as it is this class of butter that requires to be stamped as a protection to the British merchant and small grocer and the Queensland dairy farmer. It is patent that stale butter will not improve in cool storage; therefore, there would be no danger of the grade changing from a third to a second or a second to a first, as the case may be.

CERTIFICATE NUMBER.

The placing of a certificate number only on boxes of inferior grades is not likely to be productive of much good in the disposal of the butter, and where there exists a desire to gamble with the produce the number gives the chief facility with which this may be successfully accomplished.

RUINOUS TAINTS IN EXPORT BUTTER.

There are many bad flavours found in the dairy produce of the State, and to treat each separately would entail very considerable work. Here I shall deal with those two taints—stale and fishy—which are the most costly to the producer and the industry generally.

FISHINESS.

A proof of the prevalence of fishy butter is well established in the hotels and restaurants throughout Great Britain, and during the writer's travels the flavour was the most prevalent found. By this I do not infer that all fishy butters come from Australia, but upon inquiry I learned that the Australian product gave more trouble in this direction than butter from other countries. And the belief that Australia is guilty of making faulty butter has gained firm ground in some quarters, and, consequently, retail merchants are shy in their purchases of many brands. It is unfortunate that in the minds of a section of the produce trade in Britain "fishiness" is stamped on the average box of colonial butter, and merchants who are not conversant with defects in flavour are responsible for the free use of the term in describing the flavour; hence a prejudice against Australian butter. But, generally speaking, a fishy taint is quickly and accurately detected by the trade, and the belief in Australia that many other faults in flavour are placed in the same category by responsible firms in Tooley street is entirely wrong. Had Australia given more credit to those merchants and judges of flavour in butter when their complaints of fishiness were more bitter a few years ago, and resolved itself into a board of inquiry with a heartfelt desire to right what was wrong, the position of Australian butter would have been on a higher plane to-day. The injury to Australia through this lack of duty cannot be estimated, and, to make the best of a bad job, the States should unite and take active steps to remove the stigma from its national industry.

Showing that fishiness was affecting butter from this State, and that the flavour had developed in cool storage on board steamers, I give the following extracts from my reports on Queensland shipments for the season of 1906-7:—

"Queensland Government Office,
"1 Victoria street, London,
"11th April, 1907.

"*Re* butter which recently arrived by the ss. 'Orontes.' One dozen boxes of ———— butter was carefully examined, and not one was free from fishiness. Different firms complained bitterly of the quality, and urged upon me to do something to improve the brand. I may say the ———— has established a bad name of late, the last four shipments being faulty. I would suggest that a searching examination be made of the salt used by the factory, and the methods adopted in the manufacture of the butter.

"10th May, 1907.

"*Re* fishy butter shipped by ss. 'Ophir.'

Factory Brand.	Graded as.	Graded on Arrival.	Condition.
...	1st class	2nd class	Fishy
...	do.	do.	do.
...	do.	do.	do.
...	do.	do.	do.
...	do.	3rd class	Very fishy
...	do.	2nd class	Fishy
...	do.	3rd class	Very fishy
...	do.	do.	do.
...	do.	do.	do.
...	do.	do.	do.
...	do.	2nd class	Fishy
...	do.	3rd class	Very fishy

"24th May, 1907.

"*Re* fishy butter shipped by ss. 'Omrah.'

...	1st class	weak 1st class	Fishy
..	do.	bad 1st class	do.
...	do.	3rd class	Very fishy
...	do.	bad 1st class	Fishy

"27th March, 1907.

"*Re* butter shipped per ss. 'Orient.'

...	1st class	2nd class	Fishy

"10th June, 1907.

"*Re* butter shipped per ss. 'Oroya.'

...	1st class	bad 1st class	Slightly fishy
...	do.	do.	do.
...	do.	bad 2nd class	do.
...	do.	do.	Very fishy

"25th June, 1907.

"*Re* fishy butter shipped per ss. 'Ortona.'

...	1st class	bad 1st class	Fishy
...	do.	do.	Slightly fishy
...	do.	do.	do.
...	do.	2nd class	Fishy

Fishiness Developing in London.

A fishy flavour may develop in Australian butter after going into cool storage in England; or it may weaken after exposure at ordinary temperatures.

It has been said that this is not uncommon in Tooley street, and it may be correct in cases where the taint was in its initial stage or the flavour was weak at the time of chilling, and the temperature at which the butter was stored may have been favourable to the taint.

On the subject of temperature and the storage of butter in London, I wrote to the Agent-General as follows:—

"Queensland Government Offices,
"1 Victoria street, London, S.W.,
"19th June, 1907.

"Sir,—I have the honour to suggest that the leading produce merchants in Tooley street be advised not to store Queensland butter at a higher temperature than 15 degrees Fahr., my reason for this being that the result of

my investigations into fishiness and other bad flavours in butter proved that a higher temperature than 15 degrees Fahr. favours the rapid development of a fishy flavour. When it is the intention of merchants to keep imported butter for weeks in cool storage, 10 degrees Fahr. or under is strongly recommended.

"I have the honour to be,

"Sir,

"Your obedient servant,

"(Signed) G. S. THOMSON."

As yet no remedy for fishiness can be authentically given, but preventive measures should be enforced as far as our belief of the cause and knowledge of the subject directs. This may be classed under three headings—viz., the Farm, Factory, and Steamer.

Farm.

Cleanliness in all branches of farm dairying will go a long way to remedy evils in flavour, and there should be stringency in the inspection of dairies to attain this end. The discontinuance of pooling cream should have a marked bearing in eliminating taints in butter, and it should do much to increase the percentage of a first-grade article by giving to factory managers a better control of the cream supply.

Uniform consistency in the fat content and solids of cream is also regarded as important in reducing the proportion of tainted butter.

Factory.

Cleanliness of factory and utensils.

The strictest attention should be given to all that pertains to the purity and sweetness of the atmosphere in the factory, and under no consideration should the smallest detail in the hygienic or sanitary surroundings of the cream supply be neglected. Sterilisation of the utensils should be strictly enforced, and managers should not be satisfied with the appearance of their factories until they are beyond the criticism of the most fault-finding farmer. The factory is the farmer's school of instruction in the modern requirements of a dairy, and this should not be lost sight of by all butter-makers and factory employees.

The water supply is an element that requires close inspection, as contamination may take place without any ocular change being noticeable in the water, or evidence of a kind likely to attract the attention of the most vigilant person, until injury is done to the flavour and keeping properties of the butter.

From various inquiries into the relationship of salt with fishiness, there is reason to emphasise the necessity for particular care on the part of factories to prevent the salt from coming into contact with foreign matter; and, from experiences of the industry, I should think there is much cause for reform in this direction. The finest and cleanest of salt should only be used by all factories, and efforts should be made to keep the salt in a dry atmosphere, owing to its deliquescent or absorbing properties.

CHILLING THE PRODUCT.

The importance of temperature to fishiness (which the writer has proven plays a prominent part in the growth of the flavour) requires prompt consideration by factory managers and the produce trade generally. Uniformity of temperature in the treatment of milk, cream, or butter is essential to the good qualities of butter; and, as it has already been pointed out, a heated condition of the cream or butter would appear to be a forerunner to fishiness.

CARRYING TEMPERATURE OF BUTTERS.

It will always be a matter of difficulty to make it understood that a very low temperature is absolutely necessary to prevent butter which is not perfect in quality from developing a foreign taste; and, no matter what progress we make in improving the general quality of the cream supply, quantities of second-class butter will be produced. It is, therefore, to temperature we must look for assistance in arresting the change of first-grade butter to second quality, and second grade into third. I have shown that a butter may appear perfect in flavour at the time of manufacture, but upon storing at certain temperatures quickly develop harmful flavours, amongst which the dreaded fishiness will most likely be found.

After grading, chilling to a temperature not higher than 10 degrees Fahr. for shipment is strongly recommended. So very important do I consider temperature in its application to fishiness and other destructive flavours in butter that I would suggest that butter should not be carried to London at a temperature exceeding 5 degrees Fahr.; and were the butter reduced to 0 degrees Fahr. or, better still—5 degrees, the gain would be of incalculable worth to Australian dairying. That the substance of the taint is in the cream originally may not be disproved, and, while engaged in the inspection of produce in Tooley street, I found a box of butter in which the bottom half was fishy, while the top half was free of the taint. The difference in the colour and texture of the portions was conclusive that they did not belong to the same churning.

Fishiness was found in many boxes of unsalted butter, and the season's produce from one factory was affected with the flavour. We have now disposed of one important factor. Let another be briefly considered—viz., salt.

SALT.

Unsalted butter may develop a strong taint, and during the writer's experience in London boxes of unsalted butter were found to show fishiness to an extent equal to badly affected boxes of salted butter, and this was further illustrated in experiments recently conducted by the writer.

But in considering this difference the reader must not forget that the bad flavour was unnoticeable in the butter when the salt was added, otherwise fishiness would be detected at the time of classing the produce, as shown by the official mark. The taint developed subsequently, and the extent of fishiness in the salted butter may be largely due to the salt fixing the flavour, so to speak, as the growth is proceeded with. But, as our knowledge goes at present, salt favours fishiness; and is this because the active body, presuming it is an organism, uses the salt as a food in ascribing to it life and temperature?

Is the flavour the same throughout? The flavour appeared to be equally distributed throughout the affected butter, there being no indication that it was more marked in the centre than the outside, and with regard to colour nothing was observed to suggest any peculiarity in this direction. Texture gave no indication of the cause, and, as already stated, neither did the colour; and I may mention that many boxes of fishy butter were beautifully made, and, had the fishy taste been replaced by a choice flavour of butter, a product of very high quality would have been reached.

Is there any guide that fishiness is likely to develop in butter? It has been the writer's experience, and which is reiterated elsewhere in this report, that an oily or tallowy butter, or a butter that has been sweated, is more subject to a fishy flavour, and it is also suggested that a flavour of pine and marrow precludes the taint becoming pronounced.

Will it affect a factory for a season? Fishiness will affect a factory's output of butter continuously for a whole season, and some of the best factories in the Commonwealth are suffering in this way.

Is the flavour usually accompanied by any other taint or deterioration in the butter? In many cases the affected butter appears entirely free from

flavours which invariably accompany old stale cream, while in other instances stale flavours or flavours of aged cream were noticeable.

Can we deduct that the flavour is caused by a germ? It is said that the taint is not confined to butter, as cases of fishiness in bacon have come under the notice of London produce merchants, and my recent researches conclusively prove that butter will develop a strong fishy flavour at 5 degrees Fahr.

Where may its origin, &c., be found?

That the flavour of fish is not directly attributed to a condition following the manufacture of butter is now beyond doubt, but there is ample evidence to show that temperature is a vital element in controlling the cause.

RESULTS OF EXPERIMENTS.

Cold Storage.—Experiments conducted by me during the years 1898 to 1902 conclusively proved that fishiness had developed in butter between the time of its manufacture and its removal from the refrigerated chambers, extending over a period of eight weeks.

In most cases the butter before being put in cold storage was choice in aroma; but, upon thawing, the taint was very pronounced, giving one the impression that the product had been impregnated with fish brine.

Acidity of Cream.—Exhaustive reports relative to the manufacture and analyses of the milks and water used in the making of the butter showed that the high acidity of the cream was no hindrance to the growth of the taint. The following table gives the marked difference between the hours of ripening of the cream from which the fishy butter was made, also the sweet and good flavoured supplies:—

Fishy Butter: (1) very strong fishy, hours of ripening, 48; (2) strong fishy, 72 hours; (3) ditto, 48 hours; (4) ditto, 24 hours; (5) full fishy, 60 hours; (6) ditto, 30 hours; (7) light fishy, 53 hours; (8) fishy, 45 hours; (9) strong fishy, 20 hours. Good Butter: (10) good flavour, 26 hours; (11) sweet, 28 hours; (12) sweet, 20 hours; (13) sweet, 14 hours; (14) sweet, quickly ripened; (15) sweet, quickly ripened; (16) good flavour, 51 hours; (17) good flavour, 48 hours.

Colostrum Milk.—Having discovered colostrum in a number of tainted boxes, I wrote as follows:—

Five factories provided answers showing that the condition of the separator bowl afforded evidence of the milk of newly-calved cows being used in the manufacture of some of the butter. The bacteriological table showed that, in the instances referred to, the analyses pointed to an abnormal state of the milk, pus cells, and germs associated with inflammatory tissue, having been found. The butter from these five factories was, to a greater or less degree, fishy.

Salt a Cause.—A special test of dry salt *versus* brine on the flavour of export produce was conducted. The finest product included in the experiment had the cream salted, and the second, third, and fourth best qualities had the grains brined in the churn. Results of the experiments were published in 1898, which were as follows:—

1. From the production of plate and tube cultures, serious contamination of butter was shown to follow milking with dirty hands and neglect to clean the udders of the cows.
2. When bacteriological plates were exposed to the air of a dirty milkroom, colonies of injurious germs grew abundantly, also moulds of different varieties.
3. Chemical and bacteriological examinations made of water used for washing butter showed that the quality varied from extra good to very low.

4. Cultivations made from sweet milk, cream, and butter produced *Oïdium lactis* moulds.
5. Bacteriological examinations of sweet, separated, and butter-milk proved that contamination followed the use of dirty separators and churns.
6. Fishiness was found to be very pronounced in butter manufactured in districts where the herbage was rank at the date of making. In districts where the vegetation was well matured, only faint indications of fishiness were found.
7. Nearly all the fishy butter was manufactured from cream ripened to a high degree of acidity. Butter made from sweeter cream was free from a well-marked fishy flavour.
8. Colostrum was detected in the milk from five factories; fishiness was present in the butter in each instance.
9. The choicest boxes of butter were found to be free from fishiness before refrigeration; after refrigeration, nine boxes out of a total of seventeen developed fishiness, which varied from very strong to light flavour.
10. Discolouration was not observed in any fishy samples beyond what was noticed prior to chilling.
11. The fishy flavour appeared to be of equal strength throughout the body of butter.
12. Butter made from one churning, a portion of which was brined and dry salted, was unaffected with fishiness, and kept perfectly; while the other portion, that was dry salted only, developed a strong fishy flavour.
13. The best-keeping butter throughout all the tests was from brined butter grains, no dry salt being used.
14. Preservatives appeared to check fishiness.
15. Pure cultures of germs, made from very fishy butter, did not show colonies productive of fishiness.
16. Certain moulds were found to flourish in the presence of boracic acid in butter chilled.

Further experiments were conducted in which two factories took part under the following conditions:—From one churning one-half of the butter was brined in the granular stage, while the other half was dry salted on the worker in the usual manner at the rate of 2½ per cent. The addition of preservatives was disallowed. Upon concluding the first examination, the butter was put into cool storage, and kept at a temperature of 26 degrees Fahr.:—

No. 1 Factory.—Dry Salted Butter.

Tested 9th October, 1901.

	Flavour.	Texture.	Colour.	Salting.	Packing.	Total.
Maximum points ...	45	20	15	10	10	100
Awarded	39	20	15	8	10	92

Brined.

"	39	20	15	10	10	94

Flavour of dry salted butter was weak, showing milky brine; flavour of brined, weak.

Second Examination.—Dry Salted.

28th November.

Flavour.	Texture.	Colour.	Salting.	Packing.	Total.
32	20	15	10	10	87

	Flavour	Texture.	Colour.	Salting	Packing.	Total.
Brined.						
	36	20	15	10	10	91
Flavour faintly fishy.						
No. 2 Factory.—Dry Salted. 9th October.						
	40	18	15	10	10	93
Brined.						
	42	19	15	10	10	96
Flavour sweet.						
Second Examination.—Dry Salted. 28th November.						
	32	20	15	10	10	87
Flavour very distinctly fishy.						
Brined.						
	42	19	15	10	10	96
Flavour unaltered.						

This test shows that the practice of brining improved the keeping quality of the butter, and retarded fishiness. Plate cultures, taken after refrigeration, showed numerous colonies of lactic organisms from the unbrined samples, together with a few foreigners, which naturally were to be expected. Before refrigeration, fishiness was again absent to taste, so that the results of the experiments tend to show that a fishy flavour can develop during refrigeration.

Benefits of Brining.—As salting in the churn appears to arrest a fishy taint, the good features of the method may be enumerated.

Further progress was made with the experiments; and samples made from the same supply of cream containing dry salt only, and without salt, but having a chemical preservative instead, were chilled for two months, and at the conclusion of the test the sweet butter did not show a trace of fishiness, while in the salted evidence of the taint was found.

In 1902 a second series of tests threw still more light on the salt theory, and demonstrated the fact that the most encouraging results were obtained when the temperature of the butter did not exceed 20 degrees Fahr. Very choice samples, however, kept for two months at 32 degrees Fahr., without showing signs of deterioration. The chemical and bacteriological analyses conducted during the four years of the investigations (1898-1902) numbered 1,000.

A THOROUGH INVESTIGATION NECESSARY.

In view of the loss the State has sustained through fishiness in butter, I would very strongly urge that a searching investigation into the cause of the taint be instituted by the Government, on the following lines:—

Test 1.—Influence of salt.
Test 2.—Influence of water.
Test 3.—Influence of cream.

A large quantity of cream, sufficient for each test, should be put to one side by the factory experimenting, and nothing should be permitted to interfere with the accuracy of the work. For convenience it would be preferred to divide the tests into lots and parts, each part of cream to be equivalent to four and a-quarter boxes of butter.

The butter should be examined a few days after manufacture, then chilled to a temperature of 30 degrees Fahr. for two days, afterwards thawed to a temperature of 65 degrees Fahr., and again tested; returned to cool storage,

there to be kept for six weeks at the following temperature:—0 degrees Fahr., 10 degrees Fahr., 20 degrees Fahr., and 30 degrees Fahr., when the final examination should be made. In judging the boxes of butter, the scale of points to be chosen should be as follow:—

Flavour, 70. Texture, 30.

First-class butter to gain from 65 to 70 points for flavour.
Second-class butter to gain from 61 to 64 points for flavour.
Third-class butter to gain from 57 to 60 points for flavour.

Chemical and bacteriological examinations to be conducted throughout the experiments.

Test 1.—Lot 1.

Part 1.—To be salted at the rate of one quarter-pound to the gallon of cream, and 1½ per cent. to the butter.
Part 2.—To receive no salt in the cream and 2 per cent. in the butter.
Part 3.—To be brined in the churn. No salt to be added to the butter.
Part 4.—To be salted on the worker at the rate of 1½ per cwt. All other details in manufacture to be the same throughout manufacture.

Lot 2.

Divide another quantity of same supply cream into four equal parts.
Part 1.—To receive no salt in cream or butter.
Part 2.—To receive 1 per cent. of dry salt in butter.
Part 3.—To receive 2½ per cent. of dry salt in butter.
Part 4.—To receive 3½ per cent. of dry salt in butter.

Lot 3.

Divide another quantity of same supply of cream into four equal parts.

Part 1.—To be salted at the rate of 3½ per cent.	Use different brands of salt.
Part 2.—To be salted at the rate of 3½ per cent.	
Part 3.—To be salted at the rate of 3½ per cent.	
Part 4.—To be salted at the rate of 3½ per cent.	

Lot 4.

Divide another quantity of same supply of cream into four equal parts. Salt to be taken from centre of bags only, and the same brands as above to be used, and the same quantities of salt.

Lot 5.

Divide another quantity of same supply of cream into four equal parts. Salt to be taken from around the sides of bags only, and the same brands as above to be used, and the same quantities of salt.

Test 2.—Influence of Water.

Tests to be made with the ordinary factory water, also with the factory water filtered and condensed. Further tests should be made with water of the finest quality in the district.

Test 3.—Influence of Cream.

Cream from selected quantities of choicest quality should be used in Part 1 of the test, secondary cream in Part 2, and third-grade cream in Part 3. One box of each to be thoroughly washed free from buttermilk in the churn. In other respects treatment to be the same.

Inspections should be made of the farms supplying the cream, and everything connected with the milk and cream supply carefully noted. All tests for acidity, &c., to be recorded by the factory manager.

The experiments should be made at a factory where fishiness has been in evidence.

These suggestions to be regarded as a rough draft of the scheme.

OFFICIAL CORRESPONDENCE.

Being fully cognisant with the prevalence of fishiness in Australian butter, and the necessity for a searching investigation into the cause of the taint, I wrote as follows to the Agent-General, Sir Horace Tozer, who, fully recognising the importance of an inquiry, brought my suggestion under the notice of his colleagues in London:—

(Copy.)

"Queensland Government Offices,
"1 Victoria street, London, S.W.,
"14th March, 1907.

"SIR,—I have the honour to suggest that the subject of an investigation into the cause of fishiness in butter should be seriously considered by the Australian Governments, for the following reasons:—Fishiness is costing the Commonwealth of Australia thousands of pounds annually in reduced prices of butter, and the reputation of Australian brands in the London market is suffering in consequence. Further, the taint is militating against Government grading, and is likewise impeding the progress of the States in competition with other butter-exporting countries, such as Denmark, Argentine, and Siberia.

"To illustrate the danger to grading, I might point out that fishiness is seldom detected in butter at the time of shipment from the Australian States, but upon arrival in London whole parcels bearing the first-grade stamp of the Commonwealth Government are found tainted with the flavour. An inquiry into its hurtful effects would no doubt show the necessity for immediate action being taken with a view to a remedy being found.

"I have the honour to be,
"Sir,
"Your obedient servant,
"G. S. THOMSON,
"Dairy Expert for Queensland."

I also had copies of the following letter sent to the leading produce merchants in London, to ascertain their views on the subject; and I drew the Agent-General's attention to the correspondence:—

"Queensland Government Office,
"1 Victoria street, Westminster,
"London, S.W.,
"16th April, 1907.

"SIR,—I have the honour to draw your attention to the very urgent need for an investigation into the cause of fishy flavours in butter, and the conditions favouring the growth of same. It is generally known that fishiness is more prevalent and pronounced in salted than unsalted butter, and I have demonstrated that temperature governs, to a great extent, the development of the flavour, but up to the present little is known as to the true cause of the taint.

"As it concerns you as well as the Queensland Government, would you assist in this suggestion being given effect to, by briefly commenting on the extent of the flavour in colonial produce, and its influence upon the market value and popularity of the brands. I might also mention that fishiness is militating against the value of Government grading of butter, as it has been

conclusively proved that the flavour attacks the chilled product; prior to shipment it is seldom in evidence, and when detected the butter is stamped accordingly by the Government graders at Brisbane.

"I have the honour to be,
"Sir,
"Your obedient servant,
"G. S. Thomson,
"Dairy Expert for Queensland."

(Copy.)

"The Office of the Agent-General for Queensland,
"1 Victoria street,
"London, S.W., 19th April, 1907.

"Sir,—I have the honour to again report on the presence of a fishy flavour in our butter, and with particular reference to the shipments from the ——— factory. The last parcel, which I have already commented on, was very strong in the flavour, and I may say it was the worst fishy butter I have ever sampled. The buyers of this brand, which is reported to be the factory's best, are much concerned at the extent of the taint, and hopes are entertained that other factories will not become affected. To check the progress of this costly flavour, and, if possible, find the cause, I would suggest that the Government investigate the matter in a thorough manner.

"To substantiate what I have said with reference to the injury fishiness is causing our butter export trade, I beg to quote from letters received from Tooley-street merchants in reply to my inquiries into fishiness in Queensland butter.

"I have the honour to be,
"Sir,
"Your obedient servant,
"G. S. Thomson,
"Dairy Expert for Queensland.

"The Hon. Sir Horace Tozer,
"Agent-General for Queensland."

(Copy.)

"Head Office, Colonial House,
"17 to 25 Tooley street, London, S.E.,
"17th April, 1907.

"The Agent-General of Queensland, Westminster.

"Dear Sir,—In reply to the latter addressed to us by Mr. Thomson, we are very pleased to see that this question of fishiness in flavour of butter is being taken up enthusiastically.

"For years past the question has arisen, particularly where new countries and new sources of supply have been opened up, and all sorts of theories have been put forward as to the cause of this unpleasant flavour in the butter; but, so far as we know, no scientific or actual decision has been arrived at.

"The fact, however, remains, that this flavour crops up again and again in what are otherwise well-made butters, and we can but think that this most objectionable flavour is caused through dirt or unsanitary surroundings at the time either of milking or of handling of the cream. We on this side often

experience very great difficulty with butters, which, on coming out of the steamer in a hard frozen condition, open up fairly well. This fishy flavour is then scarcely perceptible, but immediately the cold is out of the butters and they are placed upon the table for consumption, then this fishiness rapidly develops, becomes very pronounced, and is most objectionable.

"The influence it has on the reputation of certain brands is very marked, and the best buyers carefully avoid those brands which they find from experience develop this fishy flavour. Agents have difficulty in selling, and the price invariably suffers.

"We congratulate you upon taking up this matter, and can assure you in is a very serious drawback to any butter to have this fishy flavour, which is one of if not the most difficult of the objectionable flavours we have to contend with on this side.

"Yours truly,

"MILLS AND SPARROW."

(Copy.)

"West Smithfield,

"London, E.C., 15th April, 1907.

"G. S. Thomson, Esq.,

"Queensland Government Office,

"1 Victoria street, S.W.

"DEAR SIR,—In reply to your favour of 4th March, which has just been handed to us by our Tooley-street branch, it is quite true that fishiness does occur more frequently in salt butter than in the unsalted article, and it is possible that this may be due to bad quality of the salt; but that this is not the sole cause is proved by the fact that several large parcels of unsalted butter have this season developed the taint very badly.

"There is no doubt that, next to rankness, fishiness is the worst flavour that it is possible to find in butter. No good buyer would knowingly purchase fishy butter for sale in any retail shop; and it very often happens that, if the defect is not noticed at the time of purchase, and it develops after it is taken out of cold store, buyers will consider that the fault is sufficient to warrant cancelling the purchase.

"The influence upon the popularity of the brand is very marked. To find fishy flavour in two consecutive parcels is quite sufficient to entirely ruin the reputation of the butter for the season at least, and it becomes necessary to create quite a fresh outlet for it.

"Whilst on this subject, we take the opportunity of giving you our views respecting one or two of the points contained in yours of the 18th February last.

"First of all, with regard to the quality of Queensland butter, we may say that there are certain fancy brands of Victorian and New South Wales butter which, in our opinion, are finer than any Queensland butter we have ever seen.

"Secondly, with regard to fishiness, and supplementing the remarks we have already made above, we have found that this flavour is the one most prevalent in bad Queensland butter. We consider that it is generally caused by the cream having become heated prior to its arrival at the factory, or by not having been sufficiently cooled before leaving the creamery; and, in any case, it is our experience that butter, which, on leaving the churn, was apparently of excellent quality, and in which it was practically impossible for even the most skilful expert to trace any suspicion of bad flavour, has, during the voyage, developed fishiness very strongly, and on tracing the butter to its origin it has generally been found that the cream was heated in transit from the creamery to the central factory.

"Fishiness may also be developed in quite perfect butter by keeping it out of cold store after it has once been frozen. We have found that Queensland butter requires exceptional care, and it very soon loses its flavour if kept out of cold store, as it very often is, for days or even weeks. We have made an invariable practice of obtaining possession of the butter immediately it is landed, and putting it into our refrigerators, holding it there until it is actually put into consumption by our retail customers. This is the only satisfactory way of dealing with Queensland butter.

"With regard to grading, we are quite of opinion that the grader should base his judgment on flavour, and, so long as it is efficiently carried out, we consider that grading by the Government is very beneficial, and likely to help the sale of Queensland butter. The great point to bear in mind is, that buyers should be able to rely upon getting uniform and reliable quality when purchasing butters of either Superfine or First Grade description.

"Yours truly,

"Lovell and Christmas, Limited,

"W. G. Lovell, Director."

"29 Tooley street,

"London, 19th April, 1907.

"G. S. Thomson, Esq.,

"Dairy Expert,

"Queensland Government Office,

"1 Victoria street, Westminster.

"Dear Sir,—Referring to your circular letter of the 4th March, we agree with you that fishiness is more prevalent in salted than unsalted butter, and no doubt a low temperature would assist in relieving merchants of the trouble, as the fishiness apparently develops in transit, it being practically unknown in the colonies.

"With this flavour in butter, no matter how fine the quality, it means ruination to any shipper; butter of the finest texture, and otherwise of top market value, not bringing more than the commonest grading, the value in every instance being reduced by at least 8s. to 10s. per cwt. Furthermore, once a brand gets a reputation of being fishy, it has to come very fine and very regular for a long period before the idea is dissolved and buyers get back on to it with confidence.

"We ourselves have never seen in any part of the colonies fishy butter; we have examined brands both in Australia and New Zealand, and reported on them as being as fine in flavour and all other points as we could wish; but, in one instance, after we had written home drawing attention to the high quality of one factory, on our return we found it had developed fishiness, and we are convinced that this fishy flavour is developed in the refrigerating chamber during transit.

"Yours faithfully,

"*Per pro* Andrew Clement and Sons, Limited,

"(Signed) J. Wallace."

"57 Klea Avenue, Clapham Common,

"London, S.W., 19th April, 1907.

Re Fishiness in Butter.

"Dear Sir,—In answer to your communication of the 16th instant, I beg to offer the following suggestions for your consideration:—

"Although the actual cause of fishiness in butter has not yet been discovered, a great deal of it can be avoided by—a careful supervision of creams; attention to temperature; and pasteurisation. Do not mix good and bad

creams together; it is far better to make two qualities of butter (good and bad) than all bad. When the butter is made, get temperature down as soon as possible, and keep it down.

"Another point which I think is of importance is the rank state of herbage after continuous rains. I fully believe this has caused more fishiness during the present season than any other cause. In support of this contention I may state that some considerable number of factories, bearing the highest reputation for the choicest butters in Victoria and New South Wales, have been turning out butter with fishiness fully developed. Every State in the Commonwealth of Australia has the taint more or less, and I have repeatedly seen a parcel of butter sold at a considerable loss on this account; there is no counter trade for a fishy butter, and I have heard that butter so affected has lost as much as 10s. per cwt. in value.

"The taint is very seldom found in pasteurised butter, neither is it prominent in Danish butter; the cows in Denmark being mostly stall fed seems to throw a little light on the matter.

"Fishiness is found a great deal in Canadian and Siberian butters, but is absent from American renovated butter, although it is found in American creamery butters. The fact of fishiness not being developed or discovered by the graders in Queensland previous to the butter being shipped emphasises the necessity of having a Government official in London to examine the butters on arrival.

"Trusting these few remarks may be of service to you, and wishing you every success in your endeavours to discover the cause of this bad odour,

"I remain,

"Your obedient servant,

"(Signed) H. ALLAN.

"G. S. Thomson, Esq.,

"Dairy Expert for Queensland."

"F. J. Lloyd, F.C.S., F.I.C.,

"Analyst and Bacteriologist,

"Consulting Chemist British Dairy Farmers' Association,

"Agricultural Analyst for the counties of Devon, Kent, Somerset, and Surrey, &c.

"Laboratory, Muscovy House,

"Trinity Square,

"London, E.C., 28th February, 1907.

"G. S. Thomson, Esq.

"MY DEAR SIR,—I am pleased to hear that you are taking steps to have the cause of fishy flavour in butter investigated.

"Some years ago, at the suggestion of Messrs. Weddel and Company, I did a little bacteriological work to see whether I could discover the cause, but I found that difficulties arose which would require some considerable amount of time and expense to try and overcome, and as I had neither the time nor means at my disposal I did not proceed further with the investigation. I mention these facts to show you that if it is determined to take up this matter it must not be expected that results will be obtained immediately. I should think it likely that it would require a year or two of careful work, the cost of which would, naturally, be considerable. But it seems evident that without such an investigation this cause of loss to colonial butter-makers will not only continue, but may become very serious, and I should think that it is better to start an investigation now than wait until one becomes a necessity. You ought to have no difficulty in getting all the Australian colonies who

export butter to join in contributing the necessary funds, but I doubt whether our Board of Agriculture would assist you, as I do not think it is a trouble which affects the English farmer. If I can help you in any way I shall be pleased.

"Yours faithfully,
"(Signed) FREDK. J. LLOYD."

OFFICIAL EXAMINATION OF EXPORTS IN LONDON.

Upon my return to Brisbane from London I wrote on the above subject as follows, which appeared in the Australian and New Zealand Press:—

It is patent to everyone that dairy produce from the Commonwealth is generally sold as Australian, and any carelessness on the part of factories is detrimental to the whole industry. The co-operative factories of Australia and New Zealand have recognised this fact, and they are now being represented in Tooley street by competent judges of produce sent from Australia, whose business is to report on everything they consider hurtful to the success of individual factories and the co-operative body as a whole. They are certainly to be congratulated in their efforts to improve the quality of Australian butter, and to create a better demand and higher price for the general output. Australia has a long way to make up on Denmark in butter-making, and the great gulf between the prices of butter from the two countries is not because Australia cannot deliver produce in Tooley street equal in quality to Denmark, but of the uncertainty in the flavour of a proportion of Australian brands, and the unreliability of the general output of many factories. Denmark's triumphal position in Britain is chiefly attributed to the uniformity of her produce, and New Zealand is following in the same direction with very encouraging results. And the same may be said of the best factories in Australia; but what proportion of the Commonwealth do they represent? may be queried. It is not the majority, and here we are called upon to direct our efforts to raise the standard of third-grade butter to second, and second to first, and to maintain a thorough distinction between the grades, thereby ensuring the confidence of the buyer that he is buying first and nothing else. But the average first-grade brands of Australian factories are not true to description as determined in London; and, unfortunately, the guilty one escapes the punishment he deserves. It is the grader who is saddled with the blame, and through the absence of Government representation in London to ascertain these things Queensland butter has been injured, and the reputation of the inspectors discredited when they were not at fault.

Grading has, without question, done more to uplift the market value of butter than any branch of education introduced on behalf of the industry. The institution of the system of grading in Queensland was a big undertaking, and before its beneficial effects were illustrated radical changes had to be made in the manufacture and classification of the butter into its respective qualities. The graders had, therefore, a heavy task to perform, and, although they could not at the outset stem every abuse current, their good work soon became evident in London and elsewhere.

INSPECTOR FOR LONDON.

Official examination of butter in London has been the subject of considerable comment of late, and it may be opportune to discuss it at this stage. In the opinion of the writer it is an absolute necessity, but considerable care is required in the selection of a suitable person. This may be regarded as of secondary importance to the lay mind, but from an educational and commercial standpoint it is fraught with much danger. For a person to do the work and give satisfaction to both parties in Australia and London it would be preferred were he an officer who had a knowledge of the conditions prevailing in the

State he represents, also an acquaintance with the factories and the officers upon whom the grading of the produce devolves. Such a person, having in addition to this a knowledge of the market requirements, would fulfil the demands necessary to giving expert advice on all matters relative to the quality of dairy produce. In Australia or any export country in which the educational side of dairying claims so much importance, care should be taken that it is not sacrificed to give preference to the commercial aspect of the question. On the commercial side, the judge who is purely a business man has buyers for all qualities of butter, and because a parcel of produce is suffering from a flavour which betrays a fault in the cream or manufacture, but is not in any way disliked by the retail merchant or wholesale buyer, his opinion would be to the disadvantage of the educational side of dairying if it is from a purely business standpoint. And reports on butter and cheese by one not intimate or thoroughly conversant with the Australian side of dairying would be subject to error, and the officer's efforts, no matter how earnest they may be, cannot possibly be attendant with success to the industry as a whole. To detect a foreign flavour, as the average man is capable of doing, is of reduced value when he has no knowledge as to the cause of it. Again, some flavours in the States of Australia are indigenous, the outcome of weeds, cultivated plants, and crops which grow at different seasons of the year; also, we have what may be termed climatic flavours. These, to the palate of the stranger in England, Scotland, or Ireland, may be misinterpreted, and lead to abuse of inspection, not only in London, but in Australia. Further, I might draw the reader's attention to the fact that terms descriptive of butter are not synonymous in the two countries, which is another reason for care in the mind of the inspector.

Government Experts and Graders.

From what has been said, I would strongly suggest that the dairy experts of the butter and cheese exporting States of the Commonwealth who know the internal working of the industry under their care, and claim a knowledge of the science and practice of their profession, should be permitted to go to London for a season every few years, to study the market requirements and the efforts of individual factories, and the grading for which they have control. Experience in Tooley street better fits a man for the responsible duties of his office in Australia, as he will learn a lot to his advantage as an adviser and instructor to a Government and State.

I would also suggest that a grading officer be sent to England every two years to spend a season there to inspect shipments and to thoroughly examine the character and details of all classes of perishable exports. A schooling in Tooley street and other commercial centres of our exports would thoroughly convince officers of the value of stringency in the inspections, and the dire necessity for going into every detail in the classification of produce.

[to be continued.]

REMEDY FOR SCOURS IN CALVES.

Mr. F. Henrickson, Sharon, writes:—I have on several occasions read in the "Queensland Agricultural Journal" remedies for this common complaint, remedies all of which no doubt are effective, but at the same time cost money, and are not always at hand in the bush. I wish to point out to the readers a very simple cure, and one every dairyman easily can grow on the farm, and, at the same time, being an ornament on any place or garden—namely, pomegranates. Take half of an ordinary sized fruit, chop it up, seeds and all, and boil in about 1 pint of milk or water; boil it down to about ½-pint, and give it to the sick animal in a bottle. One dose, I have found, will cure it; if not, give it again in a day or two's time. Gather all the fruits when ripe, cut them up in thin slices, and sun dry them, and they will keep for a long time, and always be on hand.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 29TH FEBRUARY, 1908.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Careless ...	Jersey	29 Oct., 1907	530	5·2	30·86	
No. 48 ...	Ayrshire Sh'rth'rn	14 Feb., 1908	763	3·6	30·76	
Graceful ...	Shorthorn ...	1907	617	4·4	30·40	
Cocoa ...	Jersey	20 Nov. ,,	657	4·0	29·43	
Beauty ...	Ayrshire ...	21 Dec. ,,	688	3·6	27·74	
Butter ...	Shorthorn ...	22 Aug. ,,	519	3·9	26·66	
No. 112 ...	Grade Jersey ...	23 ,, ,,	482	4·9	26·45	
Eve ...	Jersey	24 ,, ,,	472	4·9	25·90	
Mona ...	Holstein-Sh'rth'rn	26 Oct. ,,	696	3·3	25·72	
Dripping ...	,, ,, ...	28 Nov. ,,	573	4·0	25·67	
Bee ...	Jersey	16 Jan. ,,	559	4·0	25·04	
Nellie II. ...	Shorthorn ...	26 Dec. ,,	635	3·6	25·60	
Gurney ...	,, ...	13 Nov. ,,	591	3·6	23·82	
Laura ...	Ayrshire ...	20 May ,,	545	3·9	23·80	
No. 1 ...	Shorthorn ...	2 Dec. ,,	596	3·3	23·60	
Dot ...	,, ...	,,	560	3·8	22·83	
Ethel ...	Holstein-Sh'rth'rn	22 Aug. ,,	415	4·8	22·30	
Bliss ...	Jersey	14 Sep. ,,	469	4·2	22·06	
Rosepetal ...	Shorthorn ..	26 Jan. ,,	570	3·5	22·34	First calf
Lemon ...	Guernsey-Sh'rth'n	Aug. ,,	479	4·0	21·45	
Honeycomb	Shorthorn ...	23 ,, ,,	507	3·8	21·57	
Orange ...	Grade-Guernsey	1 Oct. ,,	466	4·2	21·92	
Linnet ...	Ayrshire... ...	13 Dec. ,,	583	3·1	20·24	
Gem ...	Shorthorn ...	29 Aug. ,,	471	3·9	20·57	
Clare ...	Jersey	Sep. ,,	418	4·7	21·90	

The cows were depastured in different fields. During the early part of the month grass was rather scarce.

HORSE-BREEDING.

By P. R. GORDON.

Referring to his article on horse-breeding in the February issue of the Journal, Mr. Gordon writes:—

In my short article on the above subject, contributed to your February issue, I gave the average heights of horses used in the different divisions of the Imperial army, from information supplied to me. I am now in a position to furnish authentic information on the subject. My son, Major Gordon, of the A. F. Artillery, has handed me a copy of the Field Service Pocket Book for 1907, issued by the General Staff, War Office, in which the heights of horses, without shoes, for active service, are given as below the ages stipulated being from six to twelve years:—

Cavalry	15 to 15·2 hands
Artillery and Engineers	15·0½ ,, 15·1½ ,,
Army Service Corps	15·2 ,, 15·3 ,,
Mounted Infantry	14·2 ,, 14·3½ ,,

Mules. Ages from four to fifteen years.

Draught	from 14·3 to 15·2 hands
Pack	,, 14·2 ,, 14·3 ,,

The Horse.

POINTS OF THE SUFFOLK HORSE.

Few breeds of horses have so tenaciously reproduced their salient features of identification, in so far as regards his marked characteristics, as the original race of Suffolk horses. It is perfectly clear, and there is reliable evidence of the fact, that many of the most decided points which distinguished them two hundred years ago are rarely absent in the Suffolks of the present day. The short legs, the roomy carcass, the sorrel colour, the constitution, the length of days, and that inexhaustible perseverance at the collar are still prevalent features in the chestnut of our own time. Whatever the objections to a Suffolk horse may be, no one denies the marked type of outward appearance he invariably exhibits. The produce of the crosses, in some cases, stood for years, but sooner or later they died out, and at the present time there is not a living Suffolk horse which is not descended from the old breed, and, further, there is not a single specimen of the breed now in existence which is not descended from one single source of ancestry—namely, a nameless sire foaled in the year 1768, as is proved beyond dispute or doubt by the pedigree chart in the Stud Book.

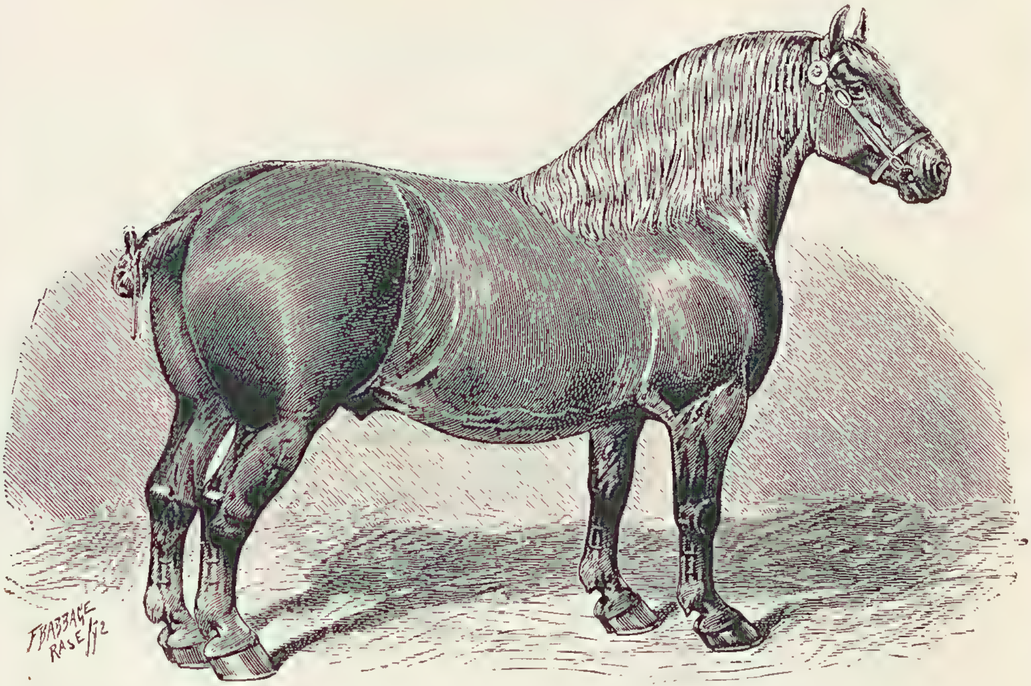
The pure Suffolk is not a large horse, but he is thick through him; his bone is much larger than his clean legs would lead a stranger to suppose, and his being so close to the ground makes him look smaller than he is. He is a short-legged, clean-boned animal, of ample size for any agricultural work, and admirably fitted for active town work as well. He should be deep in the carcass, wide in front, square behind, with hard, short legs, close-knitted joints, and devoid of all tendency to coarseness. Unless extremely well put together, anything over 16·1 should be viewed with suspicion. If those who make trial of the breed will keep such a type in their eye, the significant signs of antiquity of origin will take care of themselves. The chestnut colour, the marked capacity of thriving on a scanty diet, and long hours in the collar will be there, and so will the docile temper, the never-ending patience at the dead pull, and the many days so remarkable in the age of the Suffolk horse.

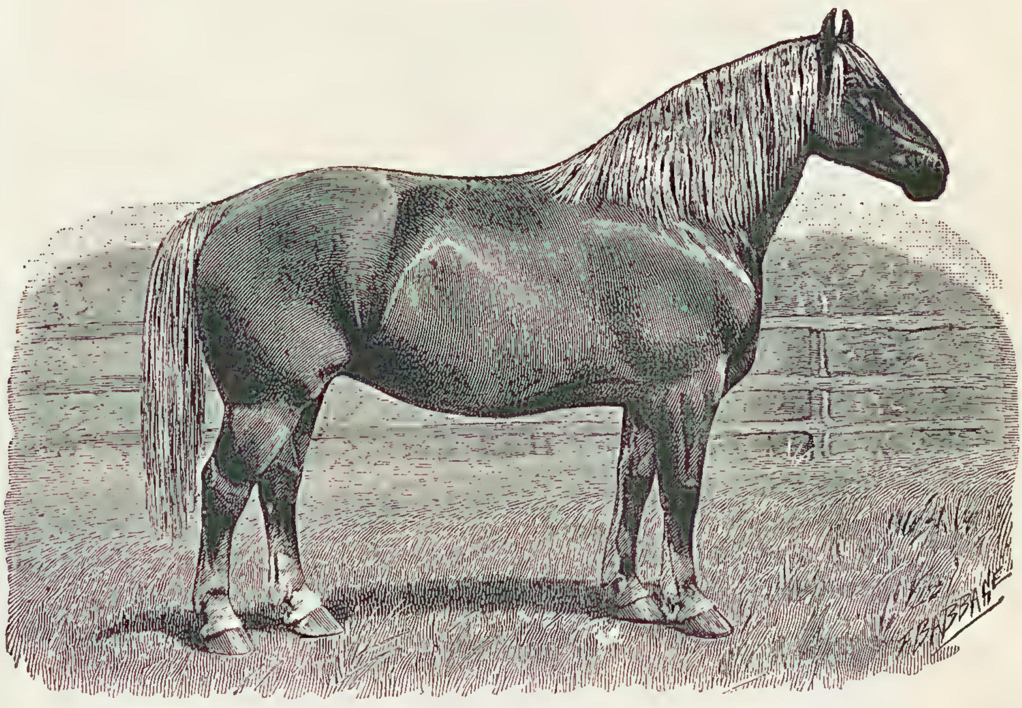
The silver-haired chestnut has been a marked feature in some of the most noted Suffolks—a mixture of white hairs in a bright chestnut coat; but if these silver hairs are plentiful enough to amount to a roan, all Suffolk breeders will reject the horse. Some have a white mane and tail, a characteristic of the original breed, but these are not fashionable, and nothing is so good as the bright chestnut, with mane and tail of the same colour. No shade of this one colour is objected to, nor does the white face or white leg act as an obstacle to registration.—"Live Stock Handbook." "Heavy Horses, Breeds and Management."

CITRUS CULTURE.

For the past few years Mr. A. H. Benson, Instructor in Fruit Culture, has contributed many valuable articles to the Journal on orchard work, particularly on the cultivation of citrus fruits. As copies of these Journals were in great demand, there were none available in 1906. Mr. Benson, therefore, embodied the articles on fruit culture in a pamphlet, which was issued in that year. Since then, the industry has been considerably extended, and it was considered necessary to bring previous writings up to date. This work has been completed by Mr. Benson prior to his departure for England, and the latest pamphlet, profusely illustrated, may be obtained, free or charge, on application to the Under Secretary for Agriculture and Stock, Brisbane.

Plate XV.





1. Suffolk Stallion, "Eclipse," 2010.
2. Suffolk Mare, "Queen of Hearts," 3066.

Horticulture.

FLOWER GARDENING.—No. 3.

By THE EDITOR.

PLANTS SUITABLE FOR OUTDOOR CULTURE.

Roses (*continued*).

What to Plant.

Each rose votary has his own favourites. Selections of best roses have been frequently made by hundreds of growers, but scarcely ever have two lists been alike. We do not intend to enumerate the best roses, but in the list below would-be growers who do not know what to plant will find many varieties which will be hard to beat.

Hybrid Teas.—Belle Siebright, Lady Mary Fitzwilliam, Mrs. R. Garrett, La France, Duchess of Albany, Kaiserin Augusta Victoria, Mildred Grant, Caroline Testout, Tennyson.

Hybrid Perpetuals.—A. K. Williams, Jubilee, Mrs. John Laing, Clio, Captain Haywood, Prince Camille de Rohan, Abbe Bramerel.

Teas.—Ernest Metz, Maman Cochet, White M. Cochet, Devoniensis, Seffrano, The Bride, Bridesmaid, Queen Olga of Greece, Souvenir d'Elsie Vardon, Muriel, Grahame, Papa Gontier, Madam Carmody, Marie van Houtte, Alexander of Russia, Catherine Mermet, Auguste Comte, Mrs. Edward Mawley, Mdlle. Jules Grobz, Francois Dubrenil, Empress Alexandra of Russia.

Others.—Cloth of Gold (N.), Carl Brunner (P.), W. R. Richardson (N.), Marechal Niel (N.), Souvenir de la Malmaison (P.), Niphetos (T.), Souvenir d'Ami (T.).

Climbers.—Climbing varieties of many of the above-mentioned sorts can be obtained, and will do well. But for spring displays and rapid growth, Fortuniana, Banksias (yellow and white), Fortune's Yellow, and Reine Olga de Wurtemburg are recommended.

Some Good Roses for Pot Culture are:—Provence—cabbage; Moss—common, *Laneii.* (The moss rose is not generally successful on the coast lands.) Hybrid China—Madame Plantiér; Hybrid Bourbon—Coup d'Hébé; Hybrid Perpetuals—Anna Alexieff, Caroline de Sansal, La Reine, Françoise Arago, John Hopper, Géant des Batailles; Bourbon—Louis Odier, Souvenir de la Malmaison; China—Cramoise Supérieure, Mrs. Bosanquet; Tea Scented—Devoniensis, Gloire de Dijon, Safranot, Souvenir d'un Ami, Penelope.

The Penelope is a new rose lately raised by Mr. J. Williams, near Brisbane. It has created great interest, and rooted plants have brought high prices. It is a very charming flower of the true Cochet form, very shapely, and so firm in petal that a good bloom will last three or four days after cutting. The ground colouring is white, and a sweet lemon yellow at the base, and deep crimson on the outer petals. There is no rose in which the same two colours are running. Penelopes should be included in any collection.

To conclude this rather long dissertation on the Queen of Flowers, the successful rosegrower of necessity is an unalienable worshipper of the Queen of Flowers, for his appreciation of the pre-eminent blooms leads, by encouraging observation and stimulating attention, to intelligent and systematic cultivation. Some, while admitting the sweet fragrance of the rose and the beauty and luxuriance of a neighbour's garden, get only the thorns instead of the roses,

for with half-hearted work they plant their trees, expecting them, because they are sorts recommended by a successful rose exhibitor, to establish themselves and grow out into floriferous wonders for all the vicinity to admire. But the best results only come from knowledge and a continuity of effort, and it is well that it is so, for it gives the results to the genuine lover, whose motto is "The rose first; spectacular display and exhibitions after." The result is that the true lover eventually gets the best results, and, having the roses, also obtains the display and the competitive successes, discovering more and more as time goes on a suitable and inspiring charm about the rose, so fragile and so sweet, that he is proud to confess with the ancient poet that—

Should Jove appoint some flower to reign
In matchless beauty on the plain,
The rose, mankind will all agree,
The rose the Queen of Flowers should be.

Roses are better when grown in beds or borders specially prepared for them. In mixed borders they frequently do well, but are ofttimes allowed to become practically choked out of all opportunity for development by the juxtaposition of gross-growing shrubs. See that they have ample room. They delight in an abundance of light and air, and yet require shelter from keen boisterous cold winds, and also from hot ones. They will grow in almost any soil, but, generally speaking, do best in a deep rich and rather heavy loam. Stiff, heavy soils can be ameliorated by the addition of ashes, soot, leaf mould, organic manures, and straw, while sandy soils can be changed to the ideal nature by the adding of clayey soil. In the latter, noisette and tea roses do very well. Cut away clean all bruised roots before planting. See that the land is well drained, and yet capable of retaining moisture. A good system of manuring is to apply a good coating of stable litter in form of a mulch, subsequently digging it in.

INSECT ENEMIES OF ROSES.

Roses, like most other plants, have a host of insect enemies, but they may be kept at bay, and even completely exterminated, by the prompt use of remedies. Mr. C. French, F.L.S., F.E.S., Victorian Government Entomologist, mentions several of these pests in a communication to "The Australian Gardener," and also gives the best remedies for their destruction:—

White Scale.

A white scale insect infesting the rose, raspberry, blackberry, currant, and other members of the same orders of plants. Male, winged; colour, light-amber with dark, irregular markings, wings white. Female, wingless, eggs red colour, form oval, and from twenty to fifty under each scale. This serious pest of the rose is one which, if not well looked after, will not only render the plant unsightly, but will kill the latter outright, so that, as in the case of most of our insect troubles, the spray pump must be kept going. Upon the first indications of the presence of this scale, cut the plant as hard back as possible for the time of the year. Get a nailbrush or something of the kind, and, after having burned the prunings, proceed to scrub the thicker shoots, using either a resin compound, kerosene emulsion, or even nicotine and soap boiled together, and with this give the woody parts a hard scrubbing. For the weaker shoots, spray with a well-diluted resin compound or soperine. If the plant be badly affected, take it carefully up during the months of either June or July, cut it back, then immerse the whole plant for twenty-four hours in a solution of tobacco water. Give the plant stems another good scrubbing, and after disinfecting the soil with some lime, or, better still, muriate of potash, replace the plant, and watch it carefully for a time. The white scale is not easy to stamp out, the great secret of success being to constantly watch the plant, and, if the slightest traces of the scale be visible, act promptly.

Looper Caterpillars (Geometrid Moths, Several Species).

The co-called "loopers" are larvæ of small moths, the name of looper having been given to the caterpillars on account of their looper-like attitude when in motion. The female moth deposits her eggs upon the young bud of the rose blossom, and, when hatched, the tiny grub at once commences to bore into the bud. If not at once noticed, the blooms so attacked are done for. The geometers belong to a group of Lepidoptera largely represented in Australia, and included amongst them are many of the worst of our "leaf-roller" pests so well known to the rose-grower. Spray with either white hellebore, weak Paris green, or nicotine.

Red Spider (Tetranychus telarius).

This well-known pest of growers is not, strictly speaking, an insect, as it belongs to the great group of acarids or mites. Still, I have considered it of sufficient importance to include in this article. The red spider is one of the most troublesome, and, in some cases, one of the most destructive, of pests, the eggs remaining both in the soil and on the plants during the whole season. The tiny animals, when fully grown, are red in colour; hence their title. Deterrents are here again in evidence. When the foliage is firm, spray with either quassia, hellebore, or a weak kerosene emulsion. When spraying keep a full strength solution for the soil, as upon examination, especially if the soil be a heavy one, myriads of the tiny beasts are to be found in it, and there remain until the late spring, when they sally out for their work of destruction. Where it can be judiciously done, keep the hose and syringe going, as once the "spider" tackles the foliage it soon spoils the latter's beauty. The red spider must be kept at in the early stages. If the "web" be once formed it is most difficult to destroy the pest without much injury to the plants themselves. Spimo, a great home remedy for spider on hops, might with advantage be tried here on roses as well as on other plants.

Rutherglen Fly (Nysius sp.)

This is a small but formidable pest of the rose-grower. It is one of the tiny species of plant bugs, and is one of the worst of our all-round insects. The perfect insects are winged, and are to be seen in countless millions. When they settle on a rose bloom they at once commence to drive their beaks into the petals, and then the whole of the nourishment required to form the perfect flower is sucked out, the buds being left on the plant shrivelled, blackened, and dying. As these insects congregate in rubbish, it is desirable to mulch the roses with grass, and at daybreak remove the mulching bodily and burn it. The crevices in the soil are also great harbouring places for this pest. The soil should, therefore, be sprayed with a strong (1 in 8) kerosene emulsion. When the pest makes its appearance it must be tackled at once, and always either in the morning, before the sun gains power, or after dusk. In the case of roses it will be difficult to use any material strong enough to kill the insects without damaging the tender foliage of the rose. Smoke fires, although successful, is but a half-hearted way of dealing with the pest, for instead of destroying the insects you drive them on to your neighbour's property, where they hibernate until the following season.

The Rutherglen fly is a hard nut to crack, and will look at the ordinary treatment meted out to insect pests as merely in the light of a huge joke, and will even thrive upon a spraying with undiluted fusil oil. I find, however, that the beast does not like either quassia chips or pyrethrum insecticides, so I would recommend these materials as worthy of a trial.

Light-brown Apple Moth (Cacœcia responsana).

This small but very destructive moth is, next to the codlin moth, our most dangerous insect pest of the apple-grower. The perfect insect is yellowish-brown, the grubs being not unlike those of the codlin moth. As in the

former species alluded to, the eggs are deposited upon the face, also in the folds of the rose petals, and the grub, when hatched, eats into the bud, thereby causing it either to fall off the tree or is otherwise rendered useless.

In the case of this pest deterrents should be used, and for this purpose the pyrethrum insecticides dusted on the young flower buds are very useful. Occasional sprayings with a weak (1 in 20) kerosene emulsion has also been used by many with much success. This moth frequently deposits its eggs about dusk and early in the morning, and, owing to the great damage it does, is well worth watching. I have seen a dozen or more buds ruined in a single night, and, as the trouble is not at once noticeable, it will be seen that careful observation and prompt treatment are necessary to attain success.

Mealy Bug (Dactylopius).

The Mealy Bug of gardeners is a great pest, especially as it attacks the roots as well as the branches of the plant, and will be quite at home in soil of any kind, especially heavy soil. This pest is more troublesome to persons who force roses either in pots or in tubs. The bug does not appear to do much harm to roses when they are planted out of doors. When this insect appears upon the plant above ground, spray with kerosene emulsion, and in spraying for this pest especially the liquid must be forced on to the plant with as much force as is consistent with the constitution of the rose that is to be treated. When the bug is on the root of the plant, disinfect with either bisulphide of carbon placed in the soil by means of an injector or sulphate of iron. In planting roses on old and used land, great care must be taken to treat the soil before planting with some muriate of potash, which is almost a specific against peach aphis when at the roots.

Cut Worms (Euplexia nigerrima and others).

Cut Worm is a terrible pest in rose gardens, the habits of the parent mother being mostly similar to that of the preceding species. The larvæ or grubs are of a dirty greenish-brown colour, and are fairly active when at their work of destruction. This grub is a most voracious feeder, and will ruin a large number of rose buds in a very short space of time. It will also attack the leaves.

The moth of the species here named is black, with a few white markings. We have reared it from the rose and carnation buds. Other noctuid moth grubs will also tackle the rose, but this is, I fancy, the worst species for florists' flowers.

Spray with white hellebore or nicotine. A good plan is to mix bran, arsenic, and treacle together into a paste, and at dusk lay pieces here and there amongst the plants.

Formula—50 lb. bran, 12 lb. arsenic, 6 lb. treacle.

Stick Case Moths (Metura and Entometa).

These insects, whilst in the larval state, are a great trouble to growers. A very few of the grubs, with their singular stick nest, will soon make short work of the foliage of a rose or any other plant which they select for attack.

The perfect insect is a small moth. The female is quite destitute of wings. It both makes and inhabits the case above mentioned. The males, although common, are but rarely seen, and are best captured by means of placing a female under a wire meat cover or a sieve, and in this way they are easily attracted.

As an illustration, I may say that for nearly fifty years I have been collecting insects, and have only secured two male specimens of these moths in the ordinary way. Fortunately, these grubs are easily destroyed, and a few applications usually suffice for that purpose. Take 1 lb. Paris green (paste form is the easiest), 4 lb. lime, mix and dilute for most plants, say, 1 gallon of

the mixture to 160 gallons of water. The grubs being leaf-eaters are at once poisoned by the material sprayed on to the parts affected.

In the case of roses, it is seldom that the grub attacks the foliage until the latter is well ripened, so that the mixture can be used at a fairly strong rate. There are a few other and smaller stick case insects which go for the rose, but these are not sufficiently numerous to do any considerable damage.

Jassid (*Jassidæ*).

We now come to a tiny green cicada beast, which, for its size, bids fair to become one of the rose-growers' worst pests; at least, when the plants are in bloom. This insect puts in an appearance in the hottest weather, and, similar to the Rutherglen fly, simply swarms on the leaves as well as the blooms. Comparatively, this insect of of recent introduction as a garden pest, although it is supposed to be a native of this State. The group to which this insect is allied contains some of the most extraordinary forms of all insect life. Let us hope that this beast may soon go hence. Deterrents in the way of quassia, hellebore, emulsions of all sorts, and also care as to the manure used, will have to be adopted. Trapping should be done soon after daylight, or after the sun has lost its power.

Fungoid diseases often appear, when the foliage must be dusted with sulphur, either dry or mixed in a solution of soft soap, and sprayed or painted on to the plants.

THE SCHOLARS' GARDEN AND WHAT WAS DONE WITH IT.

By A. C. NEATE (late Melbourne Botanic Gardens).

When visiting the A.N.A. Exhibition, in February, 1907, we inquired into the subject of school gardens in Victoria, and were afforded some interesting information on the matter by Mr. Ambrose C. Neate, for many years associated with Mr. Guilfoyle, the Curator of the Melbourne Botanic Gardens. Mr. Neate writes, enclosing a letter from two young horticulturists, "Frank and Florrie," who appear to have profited greatly by his instruction. He says:—

"The accompanying sketch of the 'Scholars' Garden, &c.,' is in the main the outcome of a talk—awhile back—with a large gathering of both lads and lassies of from eleven to fourteen years of age, in one of the public schools here; and, though delivered in this conversational form, with a view to eliciting responses from the young people, this object was the more certainly attained, because the writer exhibited during the talk quite a score of (Vick's New York) coloured plates of well-formed garden flowers, on which also remarks were made and questions asked.

"The interest seemed to be so well maintained during the three-quarters of an hour's converse, and proved what has long been testified by others, that the love of flowers is inherent, and only needs a little encouragement to prove it a welcome aid to Christian conduct with associated education both in the public schools and 'home' life of our boys and girls.

"If you would approve further notes, they (Part II.) will be sent, say, as now, for the perusal of the Queensland cousins of 'Flora' and 'Frank,' as to the operations likely to be entered upon after the summer heat has vanished, and in preparation thereafter until spring time approaches.

"These notes will be partially suggestive, or, at any rate, they will be perused (in part from my original jottings) to show sympathy with the young people as to gardening pastimes, linked with and leading up to their personal interest in floriculture generally; and, where possible, associated with such encouragement as may (will ?) be forthcoming in connection with their very own school garden.

"THE SCHOLAR'S GARDEN AND WHAT WAS DONE WITH IT.

PART I.

"*The Character of Our Ground.*—It comprises the family home, and has a garden plot in front and at the side, with a spare piece at the back; the soil is a sandy loam, about 18 inches deep, with a clay subsoil.

"My father said that my brother and myself might have a piece which is near the fence—about 36 feet long by 12 feet wide, with a partly sunny aspect—but on condition that it shall contain not only pretty flowering shrubs, but be also plentifully stocked with annuals and perennials in season, and that it must be kept clean and quite free from weeds; and, further, that we may have all the spare water available for the summer time with supplementary help from the hose and water taps when necessary.

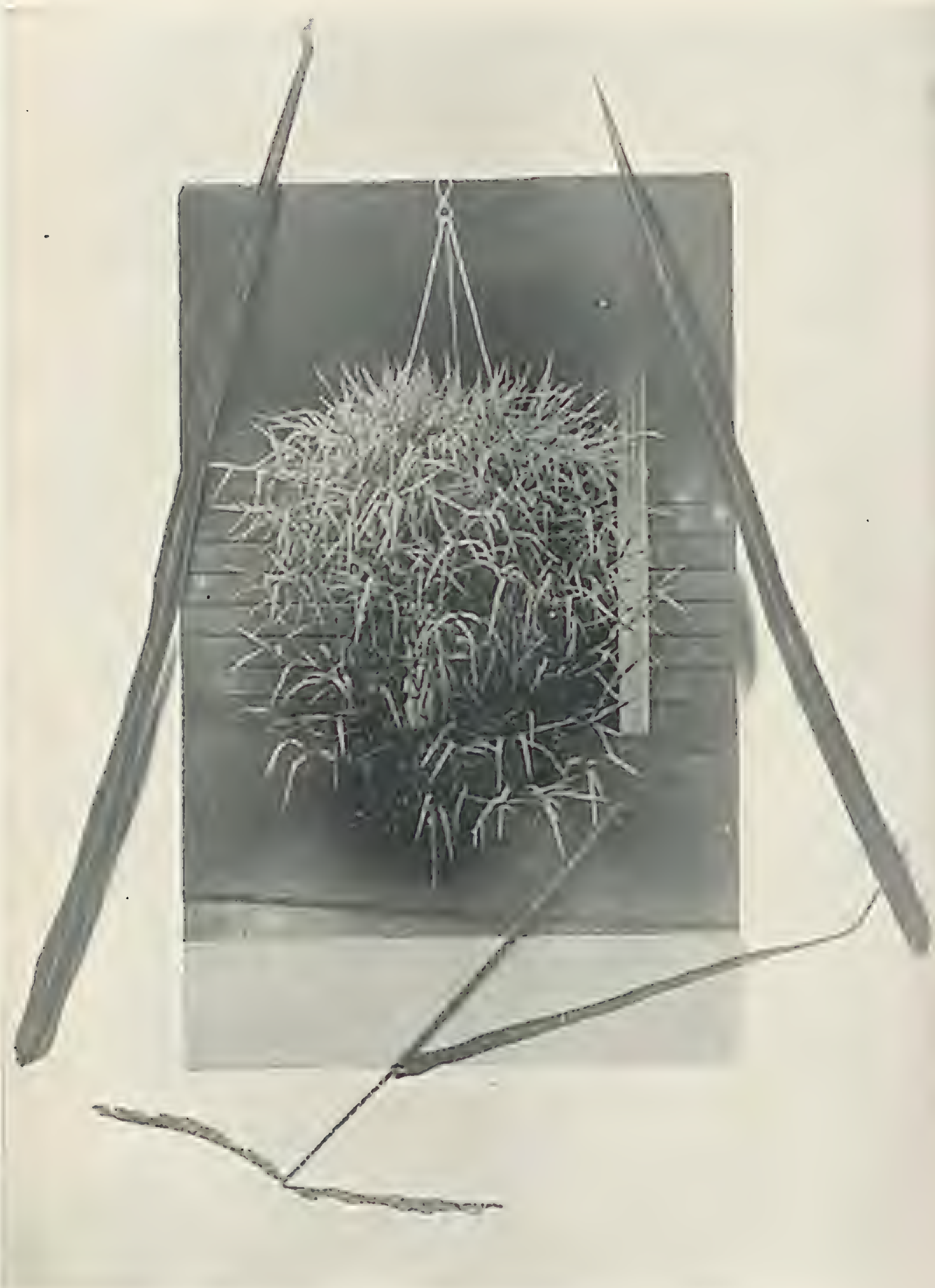
"*Well, about Our Commencement?*—We had some trouble as to the plan, and asked father's advice. He at once marked out the ground for us, and gave us a good cheery young gardener for a whole day to dig over the plot, and level it just nicely so as to leave us but little to do besides putting in the plants and seeds; also a good supply of cuttings; and as there was still fully two hours' time after the digging the gardener gave us much useful help and guidance as to our little plantation and its future possibilities. I must not forget to say we were fortunate in this our first garden to have in it at regular distances—standing well back—a fig-tree, an apricot, a loquat, and a pomegranate, all of which are, the gardener says, sure to give a nice lot of fruit next season, quite as acceptable in their way as the flowers of the other plants will be. We then planted a number of roses, which father gave us, and this proved sufficient for our first day's efforts in our very own little garden. Afterwards, during a whole week we made quite a large addition of plants, which were given to my brother or myself by friends of our father's from their pretty gardens at St. Kilda and Camberwell. These plants were of the following kinds:—Geraniums in variety, daisies (pretty pink ones), carnations, perennial phloxes, violets, hydrangeas, echeverias (various kinds), and some cuttings of three or four kinds of climbing pelargoniums, twelve kinds of roses (cuttings), and a good many other things, such as veronicas, blue, silvery-leaved, and mauve-flowered; also a supply of seeds of asters, phloxes, zinnias, and linarias for sowing in the spring.

"The way we put in the roses and other shrubby plants was at distances of about 4 feet apart, and standing well back in the bed; then we planted the smaller growing (dwarf) plants in the front of the border; some of these were verbenas, oxalis, cowslips, primroses, and here and there a pretty blue pentstemon, and a nice little set of a pink-flowered plant called by the gardener *Heuchera sanguinea*; whilst in the front we made—it multiplies very quickly—a pretty moss-like edging, rich emerald green, and we found it most suitable; we may add, too, that it was much admired by our visitors. Its name is, so father told us, *Spergula pilifera*. When one treads on this, it is as if the feet would sink in its pile carpet-like cushioning. It likes the shade to some extent, and stands a rather limited supply of sunshine; but it must have, we find, a fair amount of water put on in the evening as a matter of necessity to save sun-scorching.

"I may add, that in addition to the climbing roses and pelargoniums for the fence at the back of our plot, we added two or three passion fruit plants, some Tecomas (McKenii, and Jasminoides), also a few of *Cobœa scandens* (which we first raised from seed in a pot). The passion fruit climbers we raised from seed out of a small purchase of this fruit in a Glenferris road produce shop.

So far as we have gone with our little garden, father says, we have made a good deal of progress—everything now for the past two or three months has done very well, indeed; and he added, as he kindly tied up some of our

Plate XVI.



Paspalum distichum, *Linn.*, var. Turleyi, *Bail.*

climbers against the wire netting and trellis work, that if we waited patiently the shelter given by the climbers against the strong winds both hot and cold would, with our care in other respects, give a good show of colour as varied as the rainbow from the many flowers now growing so well, and enable us to not only supply the house or a friend now and again with a choice supply of blooms, but also to give us some very practical knowledge, of which, as to many plants and flowers, both my brother Frank and myself (Flora) were quite ignorant at the commencement of our pleasant work of partnership as amateur horticulturists in our spare time, principally either before or after school hours. And we found that we enjoyed both our meals and nightly rest the better, to say but little of the improved interest we took in our lessons, and the outcome in every way proved satisfactory, so our father and mother, also our many friends, tell us. Anyway, a good many of our fellow scholars come to see the garden frequently, and we know that some of them think of doing their share of flower culture, too, in their own ground, with the hope of doing as well or better than we did. Of course, we wish them success, but they will have to work hard to do even as well as we have done; at least we believe so from our successes, to say nothing of our many failures, for which, of course, father says (with a twinkle in his eye) we are at liberty to blame the climate! Well, we think he is right, for the terribly hot summer we have been suffering from for many weeks past has also told badly on other gardens than our own all over the suburbs of Melbourne.

"We commenced our little Malvern garden early last spring (September), and we are still enduring our summer (February), being thankful that on the whole our floral treasures have mostly survived and thriven, because (in addition to one or two welcome downpours of rain) the demand for extra care has not been denied our much loved little garden by my ever helpful brother and myself.—'FRANK AND FLORA.'

"P.S.—As soon as we can get shade enough from the climbers, which will partially cover the summer house the carpenter has made, mother and father, ourselves, and friends will often read, talk, or rest there in full view of our floral success.—'F. and F.' "

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order GRAMINEÆ.

Paspalum distichum, *Linn.*, var. **Turleyi,** *Bail.* (Plate XVI.) This variety differs only from the normal form of the well-known "Water Couch" in that the leaves are striped with white, which gives to the plant a very attractive appearance, and, as may be seen by the illustration, makes it suitable for hanging-basket work. It was discovered by Mr. F. W. Turley, nurseryman, Toowoomba, in a swamp near that town.

Tropical Industries.

TEA CULTIVATION IN THE UNITED STATES.

By GEORGE F. MITCHELL, Scientific Assistant in Tea Culture Investigations.

A little more than 100 years ago the French botanist Michaux successfully planted the first tea in the United States. This was at Middleton Barony, on the Ashly River, about 15 miles from Charleston, S.C.

In 1848, Dr. Junius Smith retired from an active life in London to ruralise and plant tea on his estate near Greenville, S.C. Both plants and seed were imported, and in an article in the American Agriculturist for 1851 Dr. Smith stated that his plants were doing finely, and had withstood a snow 8 to 9 inches deep on 3rd January of that year, and he added:—"I cannot help thinking that we have now demonstrated the adaptation of the tea plant to the soil and climate of this country, and succeeded in the permanent establishment within our own borders." Dr. Smith died soon afterwards, in 1852, and his plants, without protection, soon disappeared.

As early as 1858, the United States Government, through the Commissioner of Patents, sent Mr. Robert Fortune to China to obtain seeds to be planted in this country. In less than one year's time tea plants were distributed among private persons in the Southern and Gulf States, who later reported that the plants had been successfully cultivated by them, and in a great many cases that tea had been made at their homes.

During the year 1880, Hon. William G. Le Duc, then Commissioner of Agriculture, employed Mr. John Jackson, who had been a tea planter for fourteen years in India, to carry on experiments to test the feasibility of growing and manufacturing tea in this country. The experiments were at first conducted in Liberty County, Ga., on a place bought by the Government from Dr. Jones, who had planted tea there in 1850.

Later, 200 additional acres of land near Summerville, S.C., were leased for twenty years from Mr. Henry A. Middleton to carry on experiments there. Seed was imported from Japan, India, and China, and was also collected from the few plants then surviving in the United States that had been previously sent out by the Patent Office. From these seeds a small area was planted in tea, but before the plants had a chance to make very much growth Commissioner Le Duc was succeeded by Commissioner George B. Loring, who thought it best, because of the illness of Mr. Jackson and for other reasons, to abandon these experiments.

Since then the cultivation and manufacture of tea on a commercial scale has been practically demonstrated, in co-operation with the Bureau of Plant Industry, by Dr. Charles U. Shepard, at his "Pinehurst" tea gardens, near Summerville, S.C., where about 100 acres are planted to tea, of which the area in bearing yields about 12,000 lb. of dry tea each year. One of the gardens has yielded as much as 535 lb. of dried tea to the acre during a single season.

Although the distribution of the many plants and the establishment of the many home tea gardens in the South were steps towards encouraging the people to manufacture their own tea, these gardens soon died through lack of interest, because the important point of teaching the growers how to pluck and make the leaves into tea had been neglected.

Experiments were conducted during the summer of 1905, with a view to developing a simple process by which both the green and the black teas can be madê successfully by any intelligent person with only such utensils as are found in every kitchen. These experiments indicate very strongly that the result sought can be accomplished, and that farmers and others who have enough garden space to grow the plants for use or for ornamental purposes

can with very slight expense and trouble make enough tea for their home consumption. It is a significant fact that much of the tea grown in China is planted in the corners and waste places of farms.

Climate Required by the Tea Plant.

The climate of the Southern and Gulf States is in general admirably adapted to the cultivation of the tea plant. Although the rainfall is much less than in a great many tea-producing countries, the average annual temperature is lower, causing less evaporation and consequently requiring less rainfall. The cultivation of the tea plant can safely be risked where the temperature seldom falls below 24 degs. Fahr. and never goes below zero, and where the annual rainfall exceeds 50 inches, 30 inches or more of this precipitation occurring during the cropping season.

Selection of Soil.

A well-drained, friable, and easily penetrable clay loam or sandy loam containing a large amount of organic matter is best adapted to the cultivation of the tea plant. Very tenacious undrained soils or very sandy soils that lack water-retaining properties are not adapted to the growth of tea; neither will the plants tolerate stagnant water in the subsoil. The plants being of subtropical origin need as much protection from the cold as possible; therefore, much better results can be obtained where a southern exposure with an abundance of sunshine is selected.

Planting.*

The seed should be planted in the autumn or winter, just before a rain. A convenient place protected from the prevailing winds by a fence, a windbreak, or by the side of a house should be selected and covered with a frame about 6 feet above the ground. This frame should have cracks about 1½ to 2 inches wide, so as to admit only a little of the direct rays of the sun. It can be made from any waste lumber or loosely woven wire netting covered thinly with straw of some kind.

The soil should be pulverised to a depth of at least 8 inches and entirely freed from grass and roots. The seed should be placed 4 by 4 inches apart in little holes about 1½ inches deep. One seed should be put in each hole and covered by simply raking the surface over gently with a rake.

The nursery bed should be covered uniformly with some kind of straw to protect the seed from the cold and also to mulch the bed. Pine straw or needles, if procurable, will be found excellent for this purpose. As the plants begin to shoot above the ground, a little of the straw should be removed from time to time and the nursery thoroughly weeded. This should be kept up until autumn, when the straw should be permanently removed and the top of the frame dispensed with.

When only a few hundred plants are to be raised from seed, a large box, 12 inches deep, provided with drainage holes and kept protected from the direct sunlight will suffice. In very dry weather, water should be applied to the nursery bed or box either early in the morning or late in the afternoon, when the sun is not very hot.

Seedlings are generally transplanted in the autumn or spring after a heavy rain or when the soil is quite moist to a considerable depth. The plants may be set out twelve to eighteen months from the time of sowing the seeds, although it does no harm to let them remain in the nursery two years, but in such cases their tops should be slightly pruned to prevent them from growing too tall and slender. The plants can either be set 2 feet apart in hedgerows along fences or walks, where they can serve for ornamental purposes, or they can be placed from 2 to 5 feet apart in 5-foot rows.

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* For information concerning the vegetative propagation, veneer grafting, and herbaceous grafting of tea, see Bulletin No. 46 of the Bureau of Plant Industry, entitled "The Propagation of Tropical Fruit Trees and other Plants," 1903, pp. 19-23, and Pls. VI. and VII.

The soil should be thoroughly pulverised by spading or ploughing as deep as possible; then it should be levelled, and holes, 9 to 12 inches deep, made at the proper distances with a trowel or spade. The plants should be placed in the holes with the tap root straight down. In cases where this cannot be accomplished, owing to extreme length, the root should be pruned with a knife or other sharp instrument. The earth should be firmly compressed around the plant, which is best done with the foot. If the soil is rather dry, and it seems desirable to water the plants, this should be done.

CULTIVATION.

Frequent and shallow cultivation that will maintain a loose mulch around the plants, as well as keep them free from weeds, is best during the spring and summer, when evaporation is very pronounced, because this shallow mulching breaks the capillary tubes in the soil and lessens the evaporation. In the autumn, after the plucking season is over, the soil should be turned up thoroughly to a considerable depth with a spade or a plough, so that oxidation and disintegration will take place during the winter, when there is very little evaporation.

Commercial fertilisers or barnyard manure should be applied late in the winter or early in the spring and well worked in around the plant, but not too near the stalk, because the minute feeding roots which take up the plant food extend some distance from the stem.

PRUNING.

Every February or March after the plants are three years from seed they should be pruned down so that only two eyes are left on the preceding year's new wood. This can be done with either knives or pruning shears, making a clean slanting cut one-half inch above the top eye that is to remain.

Sometimes the plants get very thick after five or six years of service and fall off in their yield; in such cases they should be "collar pruned"—that is, pruned to the ground by sawing off the stems. This causes them to put out an abundance of new shoots, which can be picked late in the same season.*

In all cases the prunings should be buried in the middle of the rows, as they have considerable manurial value.

PLUCKING.

In plucking, which in the Southern States should begin about the first of May and continue until about the middle of October, only the bud (pekoe tip) and the first two or three leaves should be taken, as the other leaves are generally too tough to make good tea. This is done by pinching off the stem with the thumb nail and first finger just under the last leaf to be plucked. The bushes are generally plucked every seven to fifteen days, but this is determined by the development of the tender shoots, care being taken that they do not become too tough before plucking, because then they do not make good tea.

Leaves that are slow in developing always make a better flavoured product than those that grow rapidly, so a small yield is always compensated for by a more highly flavoured tea.

CURING.

In the processes described, the use of a thermometer and other technical apparatus has been entirely eliminated, and their places supplied by the senses of touch, smell, and sight. The importance of keeping the stove and kitchen utensils that are to be used absolutely clean and void of odour of every descrip-

* On this point Mr. Showers writes:—"The Cinnamara experiment plainly shows that when such heavy pruning is undertaken (and I fully agree with you that this should only be done when absolutely necessary) the process should be commenced by heavy manuring the year previous to pruning, and continued or maintained by green crops or other manures every year until the tea has been brought up to a full yield in the fourth or fifth year."

tion cannot be too strongly stated, because dry tea readily absorbs any odour that may be present. As only a few utensils are required, it is best to obtain new ones and keep them for this purpose only. All that is necessary is a 4-quart double boiler (a sauce pan with a hot-water jacket), a large pan, preferably agate-lined, a large wooden spoon or paddle, and a kneading board where the use of a clean kitchen table cannot be had.

Black Tea.

The leaves are brought in the day before they are to be made into tea, and are spread very thinly and evenly on a clean table or floor, where they are allowed to remain from twelve to twenty-four hours, when they will lose about one-half their weight by the evaporation of moisture, become very soft and flaccid, and feel like an old kid glove. In this condition they are ready for rolling. When withering is near completion, the leaves should be watched very carefully, because if allowed to go on too far they become parched and unfit for rolling.

About half a pound of the withered leaf is rolled or kneaded from twenty-five to thirty minutes on a clean table or kneading board. The operation is similar to the kneading of dough. The rolling should be very light for the first ten minutes, so as to allow the leaves to begin to twist or take on the "roll"; then the pressure should be gradually increased until all that can be exerted is applied, so as to express the juice (which should be sopped up with the leaves) and give the leaves a tight twist. This tight rolling not only makes a strong tea, but helps to preserve the flavour. Very often the leaves will be a little overwithered and rather brittle, in which case water should be sprinkled on the withered leaves until they are rendered soft enough to roll.

After rolling, the leaves are formed into a "ball" and allowed to remain in a cool and preferably damp place from three to six hours to ferment. The end of this stage in the process is indicated by the ball turning a yellowish copper colour, which can be seen when the ball is broke open. The raw herby scent has also changed to an agreeable fruity one. This stage must be watched carefully, because if allowed to go too far the leaves become sour and unfit for tea.

After fermenting, the ball is broken up and spread about half an inch thick in a large clean pan (preferably of agate ware) and placed in the stove oven to dry. The pan should be removed at intervals, and the tea turned. This should continue until the tea is very brittle to the touch and a very slight odour of tea is given off. The oven should not be too hot during this operation, as too much heat prevents uniform drying. The tea is now ready for use, and should be placed in air-tight tin boxes or cans.

Sun-cured Black Tea.

Sun-cured black tea is the same as the ordinary black tea, except that the withering is done in the sun in a much shorter time, and produces a tea more acceptable to the average taste.

The freshly-picked leaves should be spread very thinly and evenly on trays made by tacking cloth on wooden frames of any convenient size, or they may simply be spread on cloths, which in either case should be placed in the sun until the leaves become very flaccid. This will require from one and one-half to three hours or more, depending on the intensity of the sun's heat and the humidity of the atmosphere. During this operation the leaves should be turned at intervals, so as to induce uniform withering. The further procedure is identical with that already described for the black tea from the point of withering.

This tea is generally made during the months of July and August, when the heat of the sun is very intense.

GREEN TEA.

The green tea is made from the same leaves as the black, although some varieties are best adapted to make each of these respective kinds. The green-tea process is the same as that for making black tea, except that instead of withering from twelve to twenty-four hours and fermenting from three to six hours (when oxidation takes place, which renders it black) the green leaves are quickly brought in and placed in a covered double boiler—that is, a saucepan with a hot-water jacket (1 lb. of leaf to a 4-quart boiler)—and allowed to remain surrounded by boiling water from seven to nine minutes; the cover should be removed and the leaves stirred at intervals. This will render the leaves very soft and flaccid, ready for rolling. During this rapid process the oxidising agencies of the leaf are sterilised by the boiling water and steam in the hot-water jacket surrounding the leaves, and the production of a green tea is rendered possible. These flaccid leaves are rolled in like manner to the black tea for about ten minutes, being stirred at intervals until they lose some of their moisture and become sticky; then they are again rolled from fifteen to twenty minutes under all the pressure that can be applied. After rolling, they are immediately placed in the oven in a pan and turned at intervals (similar to the black tea) until they are dry and brittle to the touch and a slight scent of tea is given off.

HOW TO PREPARE TEA FOR DRINKING.

Attention must be called to the fact that ordinarily tea is not drawn properly, which not only makes it less palatable than would otherwise be the case, but also makes it very deleterious. Chemically, tea leaves yield principally thein and tannin. The former is the mild stimulant that is sought, while the latter should, as far as possible, be avoided. The thein is very soluble, and nearly all dissolves in water that has been brought to the boiling point and allowed to remain on the leaves three or four minutes, whereas if the infusion be longer extended only a little more thein is extracted, but much more tannin.

To make tea properly, bring freshly drawn water to a boil, pour it on the requisite amount of tea in a previously scalded pot, and allow it to remain covered from three to five minutes; then decant or strain into another receptacle. The spent leaves should not be used again, because practically all the stimulating ingredient has been removed, and that which is left is very deleterious to health.

CONCLUSION.

The cultivation of the tea plant in home gardens is not only profitable, but a great deal of pleasure can be derived from it at the same time that the use of the much adulterated foreign article is avoided. This is often found to contain Prussian blue, indigo turmeric soapstone, and leaves of other plants than tea, some of which are injurious to health.

In the autumn this beautiful evergreen plant is covered with handsome, fragrant, whitish flowers having a golden yellow centre, making it an excellent ornamental plant.

The children as well as the older members of the family may derive abundant pleasure in plucking and making the leaves into tea, although the process is so simple that this work can easily devolve upon any intelligent servant.

The crop of an average tea bush is about 3 oz. of cured tea during the picking season, so that 100 plants will yield about 18 lb. a year. As 1 lb. makes from 350 to 400 cups of tea, fifty plants should furnish a cup of tea apiece to a family of nine for every day in the year.—U.S. Department of Agriculture, Farmers' Bulletin 301.

[This paper is of interest as giving the history of tea in the U.S.A. and as showing the line the Department of Agriculture is taking up; one which, if well pushed, may reduce the Southern American demand for tea.—Ed. "Tropical Agriculturist," Ceylon.]

TROPICAL AGRICULTURE IN CEYLON AND INDIA.

(Extracts from a Report by Mr. H. Newport, Instructor in Tropical Agriculture, Kamerunga.)

It will be remembered that last year Mr. H. Newport, on recovering from a severe illness, was granted leave of absence for three months to regain his health by a visit to Ceylon and India. During his absence Mr. Newport has been busily engaged in inquiring into the various phases of tropical agriculture as they present themselves in the countries mentioned. He writes:—

In Ceylon, on my way to India, I called on the Honourable Hugh Clifford, Chief Secretary to the Government of Ceylon, and had an interesting conversation with him, chiefly *in re* labour for tropical industries in tropical countries. This gentleman kindly gave me a letter of introduction to Dr. Willis, of Peradeniya Royal Botanic Gardens, Kandy, and I accordingly proceeded to Kandy by rail and by trap to Peradeniya. Dr. Willis kindly gave me a good deal of his time, and conducted us over the grounds, especially the experimental portion of the gardens, across the river, to which ordinary visitors are not admitted. A description of the Botanical Gardens, magnificent and complete as they are, would be out of place in this report; the experimental section, however, was replete with interest. Extensive experiments were being conducted with many tropical products, particularly in connection with cocoa, rubber, coffee, cocoanuts, &c. Especially noticeable were the fine buildings in the Experimental Station, including laboratory, experiment rooms, drying rooms, large stores, power house, and complete machinery for the drying or preparation of products such as cocoa, coffee, rubber, &c.; for crushing and even distilling oils, from heavy oils such as castor oil to volatile oils such as citronella or lemon grass. Records and museum specimens were in the Director's office buildings. Similar ample storage and drying rooms for tropical products, especially in districts with heavy rainfall, are very necessary and requisite, though at present, in this country, largely conspicuous by their absence. Complete machinery also for artificial drying with hot air and fans, &c., as well as for preparation in marketable quantities, is a great desiderata, and would be invaluable in this country for purposes of complete and practical demonstration in encouraging the establishment of tropical industries. With regard to machinery for rubber, I am reporting especially and separately.

In these experiment plots, which in themselves must cover well over 100 acres, especial attention is paid to matters of culture as well as numerous methods of harvesting the products.

In Southern India I was fortunate in being able to meet Sir Frederick Nicholson, I.C.S., K.C.M.G., the greatest authority on agriculture in the Civil Service of India, who also gave me a great deal of time and a fund of information on cultural matters.

On the Shevaroy Hills, in the Presidency of Madras, I also met Mr. A. G. Nicholson, one of the most successful planters of Southern India, and the first to undertake the cultivation of rubber on a practical scale. Mr. A. G. Nicholson very kindly showed me over several of his estates, especially that of "Hawthorn," from which his Pará rubber biscuit obtained a first-prize gold medal at the recent Rubber Exhibition in Ceylon.

In Madras I carried a letter of introduction to the Hon. J. N. Atkinson, I.C.S., and was introduced by him to the Director of Agriculture, and also to the Director of the Horticultural Society's Gardens. Over these latter magnificent gardens I was thus enabled to see, under the most favourable circumstances, and found the rubber experiments most interesting, especially in connection with the giant creepers—species of Landolphias.

To arrange to go over rubber plantations in Ceylon, and to see the inner workings of factories, &c., is no very easy matter, and correspondence in an effort to obtain this privilege took some time.

Returning from India to Ceylon, however, I interviewed the manager of Messrs. Walker, Sons, and Company, agricultural implement and machinery manufacturers, of Colombo, Ceylon. This gentleman was most courteous and kind, affording me considerable information regarding rubber-tapping and other implements, and introducing me to Mr. Michie, the firm's engineer. Mr. Michie is the inventor and patentee of numerous machines, appliances, and implements, and is himself interested in rubber culture. He took me over Messrs. Walker and Sons' extensive workshops, where I was especially intereted in the various rubber machines in course of contruction and completed. Mr. Michie kindly introduced me to Mr. Golledge, owner of one of the largest estates in the island, thus enabling me to see the rubber machines actually at work.

Mr. Golledge's estate is at Gikiyanakanda, whence I proceeded by rail to Takura, and thence by trap. This estate had the most complete and up-to-date machinery and appliances for rubber manufacturing, and by Mr. Golledge's kindness I was enabled to see the complete processes, from tapping the trees and collecting the latex to packing the dried rubber for export to the Continent. The principal machines required for proper rubber treatment are the washing machine and the coagulating machine. Matters relating to the construction, working, prices, &c., of which I fully investigated, and in a separate report propose to submit suggestions to the Department regarding the obtaining of either full-sized or reduced models of which, for use and demonstration in this country.

I may here note that while great strides have been made in the matter of culture and preparation of rubber, and in connection with many other important tropical products, I was agreeably surprised to find the Department's work in tropical Queensland was in many respects as advanced and up to date as I found it there. Of course, in extent, owing to want of labour in field culture, and through want of room, machinery, and financial support, it is on a far smaller scale here. The line of work, also, as was to be expected, in many respects materially differed, as the objects aimed for in the experiments varied, but in many directions similar work, with but slightly differing results, had been simultaneously carried out. In tapping rubber on the estate above mentioned, the "Michie-Golledge" knives were, I found, universally used. This knife is a collaborated invention of the two gentlemen above referred to. Many varieties of knives are used in different parts, and some estates use several different kinds. Messrs. Walker, Sons, and Company have a most complete collection of tapping appliances, including knives, among which is one—the "Pask-Holloway"—the collaborated invention of Mr. G. W. Pask, recently of Melbourne, and one of the first to plant rubber in North Queensland (Castilloa, at Stratford, Cairns), and Mr. Holloway, a well-known and large estate owner and planter in Ceylon.

The cultivation and production of plantation rubber is, in the opinion of the best authorities in Ceylon, going to become a large and valuable industry. The industry is receiving the most careful consideration of experts in every branch, and all possible assistance from the Agricultural Department of the Government.

Space will not permit of my referring in this report to many tropical industries observed in their various aspects and trials and experiments inquired into and noted. I would especially remark, however, that experiments and trials of North Queensland samples of cotton in South India and Ceylon have not been universally successful.

A new product, called "Cocotine," was noted, manufactured by a simple process at Pondicherry from cocoanut oil, that appeared to me might be of use in this country, where but little use is made of the cocoanut, and copra as a marketable product is almost prohibitive, owing to the high rates of labour.

This "Cocotine" is in substance a thickened oil, prepared by having certain chemical elements in the natural oil, which cause it more or less quickly to become rancid, removed or counteracted. Cocotine is largely coming into household use in India and Ceylon as a cooking medium, being more satisfactory than any of the ordinary cooking oils, cheaper than most, and materially cheaper than lard or butter.

I obtained one sample tin, which I submit herewith for the inspection of the Department. I would suggest that it be submitted to the Government Analyst, with a view of ascertaining the chemical treatment to which it has been submitted or that may be required to make it here, and the probable cost of so doing. A large market exists in the East for this commodity, and, in view of the comparatively high cost of lard here, probably a large demand would soon result within the Commonwealth.

The tins, such as submitted, are sold in Ceylon at 45 cents, equal to 7 1-5d., and in South India from 7d. to 8d. according to distance from cities and cost of transport.

I found a new variety of tinned milk to be largely taking the place of the old Swiss condensed milk. The thickened and sweetened condensed milk has a flavour that is disliked by many, also the mixing necessary before use can be made of it—mixture possibly with impure, or, at any rate, unsterilised, liquids, renders it undesirable for many purposes.

The kind of milk I found to be replacing this milk on the market is known as "sterilised milk," and is put up in tins in a similar manner to condensed milk. The "Ideal" is perhaps the most popular, and next to it a brand known as "Dahl's"; the former is a Swiss, and the latter a Norwegian, production. Stone and Sons' Diamond Reef Brand (also Norwegian) is being largely used in Ceylon. This milk requires no mixing, and on merely piercing the tin can be poured out and used as it is. It has no peculiar flavour, and is with difficulty distinguished from fresh cow's milk. The price is about the same as for condensed milk—viz., 5d. to 7d. per tin, retail, according to locality. I obtained samples of "Ideal" and "Diamond Reef" brands, sold respectively at 6 2-5d. and 7 1-5d. per tin in Ceylon, and which I submit for the information of the Department, thinking that if not already known (I have never seen or heard of it here) these samples may be of interest and use, in view of the stimulus that is being given to the manufacture of tinned milk in Queensland.

I also saw and made inquiries concerning various economic plants and trees that would be of value to this country, among them the cocoanut palm that comes into bearing in three years from seed. This is to be found in cultivation by the Maharajah Bobille, of Vizagapatam, but I regret I had neither time nor opportunity to obtain plants or seed.

SYNTHETIC RUBBER.

By HOWARD NEWPORT, F.R.H.S., Instructor in Tropical Agriculture, Cairns.

Since I have been frequently asked, both by letter and by personal applicants, for advice and information whether there was anything to be feared in the direction of synthetic or chemically produced rubber or substitutes for rubber, and as the belief that it would shortly be so produced has been given me as a reason why some will not plant, the following little article, from the latest issue to hand of the "India Rubber World" (No. 4, Vol. 37, of 1st January, page 101), embodying as it does the latest opinion of the greatest

authorities on the subject and those best qualified to know and to judge, may prove of interest both to those who have already embarked on the cultivation of plantation rubber and to prospective producers of this valuable product:—

CONCERNING SYNTHETIC RUBBER.

Just why so many people think that they achieve synthetic rubber, and why so many more—rubber-planters, importers, and manufacturers—are fearful that it will come and in some way upset their business, it is hard to imagine. Reviewing the year's progress in this line, the producers of rubber by artificial means have done everything but produce. Indeed, they seem to lack knowledge as to what synthesis is. It is specifically the building up of complex compounds by special reactions whereby their component radicals are so grouped that the resulting substances are identical in every respect with the natural articles.

The producers of so-called synthetic rubber group themselves into three classes. The first makes something of the oil substitute type that may be used in connection with india rubber, but that has no particular value used alone. They hypnotise themselves into believing that it is practically rubber.

This is not synthesis; it is silliness.

The second class begins with crude rubber, fine Pará preferably, doctoring it with something like oil of wintergreen to thoroughly disguise it, and, by dark and mysterious ways and sleight-of-hand performances, produce for the edification of capital what they call "synthetic rubber."

This is not synthesis; it is sin.

The third class embraces honest, usually aged scientists, who buy most of the ingredients for secret formulas, upset all rules governing chemical reactions (not knowing at just what point the inventor slips the ace out of his sleeve), and produce "synthetic rubber."

This is not synthesis; it is senility.

Not that it is claimed that synthetic rubber will never be attained. It may be. But its first cost for years will probably make it only the plaything of the laboratory. Indeed, so far distant does the production of synthetic rubber seem, when one reviews the attempts towards its production, that it is safe to say that when it does appear the cradles of the land will also be filled synthetically.

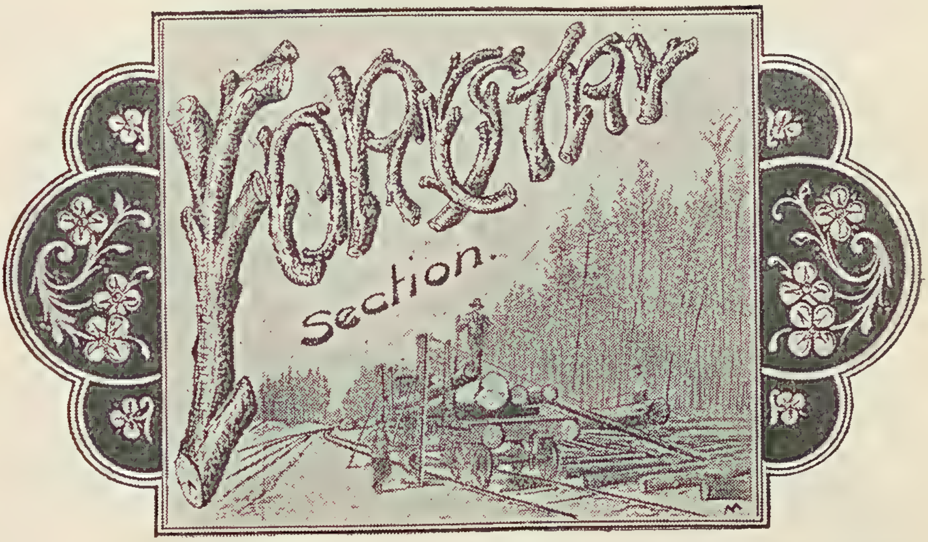
Not to hit in any way the honest seeker for this ideal product, but for the guidance of such geniuses as the one who is now in enforced retirement because of his synthetic camphor claims, and who deserves "several years" for robbing certain New Yorkers by his "synthetic rubber" claim, the following working formula is submitted:—

10 lb. Pará rubber.
1 gallon benzol.
1 oz. oil of wintergreen.

Mix thoroughly and evaporate the solvent, then thoroughly mix—

15 parts above mixture.
10 parts ignorance.
25 parts avarice.
50 parts duplicity.

Compound in secret.



Queensland still possesses large areas of forest country containing millions of feet of splendid hard and soft woods, not including the beautiful scrub timbers, which are, of necessity, ruthlessly destroyed as soon as the land is required by farmers for cultivation or for dairying purposes. And this destruction is unavoidable, and would be unavoidable in remote districts, even though railways were built with the idea of conveying the timber to the coast. Timber in the log is cumbersome to move, and the railway freight is necessarily heavy, too heavy to admit of establishing a profitable timber export business outside a certain radius. Nevertheless, it is not disputable that our timber supplies are gradually becoming less, especially so in the case of pine, cedar, and beech. There is only one way of keeping up perpetual supplies of these valuable trees, and that is by reafforestation. The problem is, how to do this effectively and systematically. Something has been done in the Cairns district in the way of planting out young cedars in the denuded scrubs, but the work has progressed but slowly, owing to various causes, expense being the chief factor.

In Germany the timber yield is sustained by a vigorous policy of forest management. There, for every tree removed, three young trees have to be planted. In Saxony the cut increased during seventy years from the year 1820 by 50 per cent., and by an additional 5 per cent. in the succeeding four years.

We have just received the full report of the Committee on Forestry, presented by Mr. L. A. Thurston, president of the committee, at the annual meeting of the Hawaiian Sugar-planters' Association, and published in the "Hawaiian Forester" (November, 1907). The following extracts from the report should prove interesting to all who are interested in the conservation of our Queensland forests:—

PINCHOT ON FOREST FAILURE.

THE LUMBER SHORTAGE AND HARDWOOD FAMINE IN THE UNITED STATES.

Gifford Pinchot, chief of the United States Forest Service, in an article published in "The Outlook" for 12th October, 1907, makes the following statement:—

After enumerating the statistics showing the amount of standing timber now in the United States, the present annual consumption, and the present

annual growth, he states: . . . "The result shows a probable duration of our supplies of timber of not more than thirty-three years.

"Estimates of this kind are almost inevitably misleading. For example, it is certain that the rate of consumption of timber will increase enormously in the future, as it has in the past, so long as supplies remain to draw upon. Exact knowledge of many other factors is needed before closely accurate results can be obtained. The figures cited are, however, sufficiently reliable to make it certain that the United States has already crossed the verge of a timber famine so severe that its blighting effects will be felt in every household in the land.

"The rise in the price of lumber which marked the opening of the present century is the beginning of a vastly greater and more rapid rise which is to come.

"We must necessarily begin to suffer from the scarcity of timber long before our supplies are completely exhausted.

"It is well to remember that there is no foreign source from which we can draw cheap and abundant supplies of timber to meet a demand *per capita* so large as to be without parallel in the world, and that the suffering which will result from the progressive failure of our timber was but faintly foreshadowed by the recent temporary scarcity of coal.

WHEN THE FORESTS FAIL.

"What will happen when the forests fail?

"In the first place, the business of lumbering will disappear. It is now the fourth greatest industry in the United States.

"All forms of building industries will suffer with it, and the occupants of houses, offices, and stores must pay the added cost.

"Mining will become vastly more expensive; and, with the rise in the cost of mining, there must follow a corresponding rise in the price of coal, iron, and other minerals.

"The railways, which have, as yet, failed entirely to develop a satisfactory substitute for the wooden tie (and must, in the opinion of their best engineers, continue to fail), will be profoundly affected, and the cost of transportation will suffer a corresponding increase.

"Water power for lighting, manufacturing, and transportation, and the movement of freight and passengers by inland waterways, will be affected still more directly than the steam railways.

"The cultivation of the soil, with or without irrigation, will be hampered by the increased cost of agricultural tools, fencing, and the wood needed for other purposes about a farm. Irrigated agriculture will suffer most of all, for the destruction of the forests means the loss of the waters as surely as night follows day.

"With the rise in the cost of producing food, the cost of food itself will rise. Commerce in general will necessarily be affected by the difficulties of the primary industries upon which it depends.

A SUICIDAL POLICY.

"In a word, when the forests fail, the daily life of the average citizen will inevitably feel the pinch on every side. And the forests have already begun to fail, as the direct result of the suicidal policy of forest destruction which the people of the United States have allowed themselves to pursue. . .

"We are accustomed, and rightly accustomed, to take pride in the vigorous and healthful growth of the United States, and in its vast promise for the future. Yet we are making no preparation to realise what we so easily and glibly foresee and predict. The vast possibilities of our great future will become realities only if we make ourselves, in a sense, responsible for that future.

"The planned and orderly development and conservation of our natural resources is the first duty of the United States."

MORE EXPERT EVIDENCE.

In a report on the timber supply of the United States, made by R. S. Kellogg, of the Federal Forest Service, in April, 1897, he makes the following statements:—

"The lavish manner in which the United States has consumed the products of its forests and the rapidity with which our timber supply is melting away are wholly unappreciated by those who have never given the matter more than passing consideration. . . .

"Rapidly as the population of the United States has increased, the lumber consumption has increased still more rapidly. In round numbers, the lumber cut in 1880 was 18 billion feet; in 1890, 24 billion feet; and in 1900, 35 billion feet. The increase in population from 1880 to 1900 was 52 per cent., but in lumber cut 94 per cent.

"The original stand of white pine in the North-east is almost entirely cut out. The present stand in the North-eastern States is mainly spruce, second-growth white pine, and hemlock. . . .

"It is well known that the days of white pine are rapidly passing, and . . . it will, in a few years, cease to be a large factor in the timber supply of the United States.

SAWMILLS GO OUT OF BUSINESS.

"At the last annual meeting of the Northern Pine Manufacturers' Association in Minneapolis, Minnesota, the secretary presented the following statement:—

"'Since 1895, 248 firms, representing an annual output of pine lumber of 4¼ billion feet, have retired from business, due to the exhaustion of their timber supply. Plants representing approximately 500 million feet capacity, which sawed in 1906, will not be operated in 1907.'

"The amount of hardwood stumpage is rapidly decreasing. The hardwood cut in 1900 was 8 billion feet; in 1904, 6 billion feet; and the present annual cut of hardwoods is about 5 billion feet.

"As an instance of the timber shortage in the East, it is stated that in New England 6 inches is now a common cutting diameter for white pine, while formerly, and where lumbering is intelligently done, 18 inches is the minimum limit.

"We are rapidly using up our forest capital. Our present annual consumption of wood in all forms is from three to four times as great as the annual increment of our forests. . . . Every indication points to the fact that, under present conditions, the maximum annual yield of forest products for the country as a whole has been reached, and that, in a comparatively short time, there will be a marked decrease in the total output, as there is now in several items. Neither is there any great supply of timber to turn to outside of the United States. With the exception of importations of small quantities of high-class woods, like mahogany, the only promising source is Canada; but most of the timber there will be required at home. Even now Douglas fir (North-west) is bringing higher prices in Canada than in American markets."

DR. FERNOW ON THE LUMBER SHORTAGE.

In February, 1907, Dr. B. E. Fernow, one of the leading forestry authorities in the United States, made the following statement in an article published in "Forestry and Irrigation" for February, 1907:—

"One hundred and fifty years ago Germany found herself in very much the same condition as regards her forest resources as we are to-day in the United States—all accessible portions more or less culled, or in poor coppice, burnt over, and damaged by cattle, the valuable virgin timber mostly confined to distant and inaccessible locations. Sporadic attempts existed here and there at protection, at regulation of the cut, at conservative lumbering,

and still more sporadic attempts at reforestation. . . . Yet, until the beginning of the nineteenth century, reduction of supplies without adequate reproduction proceeded, and around the year 1800 the wood famine had become acute, giving rise to the same kind of agitation and literature which we have experienced, even to bringing in the catalpa and other such small rapid growers as the saviours of the nation.

PROFITABLE FORESTRY IN EUROPE.

"The severity of the timber shortage in Germany at that time was temporarily relieved through increased production of coal and the building of railroads in hitherto inaccessible forest regions. Then came the vigorous organisation of a settled policy of forest management, based upon the principle of sustained yield, or the cutting of the increment only, without lessening the wood capital. The results of this policy were that in Saxony the cut increased between the years 1820 and 1890—just 50 per cent.—and up to 1904 has increased by another 5 per cent.

"In Prussia, in 1830, the cut was 20 cubic feet per acre, and in 1865 increased to only 24 cubic feet. In 1890 it was 52, and in 1904 it had grown to 65 cubic feet. Forest management increased the average acre production in seventy-five years more than three-fold.

"Every acre of forest in Germany—State, municipal, and private; good, bad, and indifferent; productive and unproductive—now yields an average net profit of 2·40 dollars per acre annually, representing 5 per cent. on a valuation of 50 dollars per acre, and this is constantly improving.

"It must not be overlooked that these results have come largely from non-agricultural lands, the sandy plains, the swamps, the rough mountain slopes, and from forests which were mismanaged like ours.

"Can we expect to attain the same or similar results?

"We ought to do much better, for we have the hundred years of experience of our friends across the water to draw on, and we can avoid many of the mistakes which they have naturally made and paid for."

HALL ON THE HARDWOOD FAMINE.

In the report by William L. Hall, assistant forester of the United States, on "The Waning Hardwood Supply of the United States . . . " dated 24th September, 1907, and which has just arrived in Honolulu, he makes the statement that the cut of hardwood lumber in the United States decreased 15 per cent. between 1899 and 1906.

"This decrease took place during a period when American industries sprang forward at a pace unparalleled; when there was the strongest demand ever known for every class of structural material; when the output of pig iron increased 15 per cent., that of cement 132 per cent., and even that of softwood timber 15 per cent.

"That the decrease is due to diminished supply rather than to lessened demand seems to be proved beyond question. During the same period the wholesale price of various classes of hardwood lumber advanced from 25 to 65 per cent.; every kind of hardwood found in quantity sufficient to make it useful has been put on the market, and hardwood timber is now being cut in every State and every locality where it exists in quantity large enough to be cut with profit. These conditions could not prevail were the decrease in production due to a falling off in demand.

DECREASE OF HARDWOOD SUPPLY.

"Since 1899 the production of oak has decreased 36 per cent.; of yellow poplar, 37 per cent.; of elm, 50 per cent.; of cotton-wood, 36 per cent.; and of ash, 20 per cent."

It is stated that the shortage is being made up by resorting to the inferior hardwoods, and, "although almost all possible new woods have been

brought into use, there has still been a shrinkage in the total output of 15 per cent.

"The supply in Indiana and Ohio, the original centre of hardwood production, is practically exhausted. . . . In all of the States west of the Mississippi Valley the supply is small, and can never become much of a factor. The impressive thing is, that we are bringing hardwoods from far and near, and still the cut is going down.

"The southern part of Michigan, which originally bore magnificent hardwoods, was the first part of the State to be cleared. . . . The same is true of Wisconsin and Minnesota. The almost complete exhaustion of their timber supply and the transformation of their hardwood lands into farms are apparently the only results to be expected. . . . In the Appalachian, as in the other regions, the hardwood lumbermen are working upon the remnants. The supply is getting short, and the end is coming into sight."

ONLY SIXTEEN YEARS' SUPPLY LEFT.

Mr. Hall estimates that from the statistics of present supply of hardwood, and present annual use of the same, there exist in the United States to-day only sixteen years' supply.

He says that since 1898 the price of hard maple, per 1,000 feet, board measure, has increased from 20 dollars to 32·50 dollars per 1,000 feet; of yellow poplar, from 30 dollars to 53·50 per 1,000 feet; of hickory, from 45 dollars to 65 dollars per 1,000 feet; and of quartered white oak, from 60 dollars to 80 dollars per 1,000 feet.

Accompanying this increase in price has been a lowering of the standard. Prior to 1907, the rules of the trade required even lengths, with a minimum length of 6 feet. In 1907, the Hardwood Lumber Association reduced the minimum to lengths of 4 feet, and allowed odd lengths.

"IT EMPHASISES THE FACT THAT WE ARE DOWN TO THE ROCK BOTTOM, AND REQUIRE EVERY SOUND PIECE OF HARDWOOD LUMBER THAT CAN BE PUT UPON THE MARKET."

Between 1899 and 1906 the number of employees in the hardwood industry in Ohio decreased 40 per cent., and in Indiana 42 per cent.

An enumeration is given of the businesses directly depending upon hardwood—viz., lumber, cooperage, furniture, vehicles, musical instruments, small wooden-ware, agricultural implements, cars, boxes and crates, railroad ties, telephone and telegraph poles, and house finishing.

Mr. Hall concludes:—

"The exhaustion of the hardwood supply means the loss of these industries to the States in which they are located. . . . How intensely the whole country would feel the loss of its hardwood timber . . . can scarcely be realised. . . . A general failure in crops may affect industrial conditions for a few years; a failure in the hardwood supply would be a blight upon our industries through more than a generation.

THE SITUATION IN BRIEF.

"The situation, in brief, is this: We have about a fifteen years' supply of hardwood lumber now ready to cut. . . . The inevitable conclusion is, that there are lean years close ahead in the use of hardwood timber. There is to be a gap in the supply which exists, and the supply which will have to be provided. How large that gap will be depends upon how soon and how effectively we begin to make provision for the future supply. The present indications are that, in spite of the best we can do, there will be a shortage of hardwoods running through at least fifteen years. How acute that shortage may become, and how serious a check it will put upon the industries concerned, cannot now be foretold. That it will strike at the very foundation of some

of the country's most important industries is unquestionable. This much is true beyond doubt: That we are dangerously near a hardwood famine, and have made no provision against it."

After designating possible substitutes for hardwoods, such as metal, concrete, and softwoods, Mr. Hall says:—

THE ONLY PRACTICABLE SOLUTION.

"There to be but one practicable solution, and that is to maintain permanently, under a proper system of forestry, a sufficient area of hardwood land to produce by growth a large proportion of the hardwood timber which the nation requires. . . . The longer the delay in putting the forest under control, the longer continued and more extreme will be the shortage."

The foregoing statements are those of professional salaried experts, with nothing to gain by exaggeration, and are based upon statistics made with all the exhaustive resources of the United States Treasury.

These statistics are brought right up to the year 1907, and bring home to us, as nothing that I have yet seen does, the fact that not only forest protection, but forest reproduction, is of vital import to the sugar industry, as well as every other industry in Hawaii.

We have for years been unthinkingly cutting off our forests for firewood; devastating them with cattle; carelessly allowing their destruction by wild goats, and paying practically no attention to reforesting; while we have imported not only all kinds of both soft and hard wood, both manufactured and unmanufactured, for general domestic use, but have also been importing even our railroad ties, telephone poles, and fence posts.

Within the year we have been brought up against the fact that not only have prices gone ballooning, but that even railroad ties and fence posts are hard to obtain, even at the advanced prices. If prices of lumber in general, and hardwood in particular, are going to be prohibitory in the United States, where the material is produced, they are going to be more so here, where the added freight must be reckoned with.

THE REMEDY IN HAWAII.

What is the remedy?

There is and can be only one remedy. It is the same here that it is in the United States, and the same there that it was in Europe when they faced the same condition a hundred years ago.

The remedy is to stop unnecessary destruction of forests, and immediately begin reforestation, both by protection of semi-forested areas, so that partly destroyed forests will return by natural means; and by replanting.

This should be done both through the medium of private effort and public appropriation.

It lies within the power of every sugar plantation and every cattle ranch in the territory to, within the year, at an expense so small that it bears no comparison to the benefits to be derived, shut out cattle from every portion of the land which ought to be in forest, and, if no more is done, to plant along roadways, around house-lots, in gulches, waste land, and on steep hill sides unsuitable for agriculture, trees enough to, within the next ten years, supply a very large proportion, if not the whole, of the fence posts, railroad ties, telephone poles, and firewood needed for consumption in the territory.

RAPID-GROWING HARDWOODS.

The few years during which there has been a skeleton of a forestry department maintained by the Government in Hawaii has demonstrated that we have available a highly valuable assortment of rapid-growing hardwood trees, such as a number of the varieties of the eucalypti, the ironwoods, the

silver oak, and some of the acacias, besides that most valuable lumber tree, the Japanese pine.

We do not need any statistics or foreign expert advice upon this subject. The forestry experiments which have been carried on by the Government on the ridges back of Honolulu; by the Lihue Plantation and George Wilcox on Kauai; by the Baldwin plantations; the Haleakala Ranch, and by Captain Makee at Ulupalakua, on the island of Maui, and by the Pacific Sugar Company on Hawaii, have already demonstrated what these trees will do.

RESULTS ON HALEAKALA RANCH.

As to what can be accomplished by continuous effort at small expense, I speak only as to my own knowledge in connection with the Haleakala Ranch on Maui, where, within the past seven years, at an expense of less than 500 dollars a year, there have been planted out, and are now growing well, about 60,000 trees, which are already beginning to yield timber for fencing and all necessary ranching purposes.

During the past summer on this ranch there were cut from thirty-three second-growth rastrada eucalyptus trees 230 good fence posts.

There is no reason why equally good results cannot be obtained almost anywhere on the islands.

Private work on forests is within the immediate control of individuals and corporations, but public work of this kind requires legislative appropriation.

REFORESTING APPROPRIATIONS NEEDED.

Up to the present time the Hawaiian Legislature has contented itself with appropriations for forest purposes barely sufficient to maintain a skeleton organisation, without sufficient funds to take up the active work of reforesting.

To obtain appropriations for this purpose requires a public enlightenment and support from that portion of the community which recognises the necessity of the situation.

There is no organisation in the territory which compares with the Planters' Association in power to bring to bear upon the Legislature intelligent public opinion and influence.

I submit that not only should the association pass resolutions to be presented to the Legislature in support of appropriations for reforesting, but that, in their own interests, individual members should use their private influence in support of such a policy.

FOUNDATION PRINCIPLES INVOLVED.

I consider that the principles involved in the differentiation between the Hilo forest on the one hand, and the Kau and Kona forests on the other, lie at the foundation of the forestry question in this territory, and that, if the policy as outlined in connection with this particular case can be established as the continuing policy of the territory, it will far more than justify all the expense which the Forestry Department of the Government has heretofore caused, and be added cause for congratulation that the territory has been so fortunate as to secure at the head of its Forestry Department an educated forester, representing the most advanced study and intelligence concerning the subject available in the United States.

Although the Forestry Department in Hawaii has not, as yet, much to show in the way of material returns, it is of immense advantage to the people of this territory to have the principles upon which they should proceed intelligently studied out on the ground, and clearly expressed, so that the layman may understand why it is good economy to lumber one section of the island forests and not to do so in another.

THE IMPORTANT FEATURE.

The Important Feature in the Policy Emphasised by the Foregoing Report is the Radical Difference between the Forests which Act as a Regulator of the Flow of Water and Forests from which there is no Water Flow.

Whether forests affect climate, especially rainfall, or not, is a disputed point.

My personal belief, based on personal knowledge of a large part of this territory, is that it does have a strong effect thereon in many parts of this territory.

There is, however, no dispute, and can be no dispute, that a thick forest cover not only helps but is absolutely essential to the maintenance of an even flow of water from a given water-producing area.

I go further, and claim that a forest on a water-producing area in this territory, with its heavy rainfalls and short watersheds, is absolutely essential to any economical flow of water at all.

HAWAIIAN WATERSHEDS ARE SHORT.

The Hawaiian streams, which furnish water for irrigation and other economic use, all rise in forest areas with watersheds of from five or six to less than thirty miles in length.

It requires no scientific study or reasoning to demonstrate that water flowing upon an area of land averaging not over 12 to 15 miles in length, and on a grade of from 5 to 50 per cent., will not hold water for more than a few hours after rainfall has ceased, unless there is not only a forest but a thick jungle of ferns, moss, and *débris* to prevent its rushing in a torrent to the sea.

The forest is not enough under such circumstances. There must be a subsidiary of small trees and shrubs; under that a growth of ferns and creeping vines, and in addition to that an undisturbed matting of leaves, sticks, and moss, creating a mass of material so thick as to hamper and almost prevent the flow of water. Once a clearing is made sufficient for the water to wear a course for itself, the heavy torrential rains, with the steep grade, will cut innumerable watercourses to the sea, denuding the land of soil and draining off the water supply.

The almost constant standing water and semi-swampy condition existing in Hawaiian water-producing forests is essential to the very existence of this character of forest, as the existence of this character of forest is necessary to the conservation of the water supply. Neither can exist without the other.

Under these circumstances, any radical interference whatsoever with any portion of the forest immediately sets in motion a train of events which eventually destroys the whole.

In other words, it is my firm conviction, based upon fairly close observation extending over the last thirty-five years, that the forest growth on the water-producing watersheds of Hawaii must be, as far as possible, absolutely closed to interference, either by man or beast, or the result will be, in spite of all effort to the contrary, a doubly reacting disintegration of the forest, and diminution and final destruction of the area as an economic water-producing source.

NON-WATER PRODUCING FORESTS.

In marked contrast to this, as brought out by Mr. Hosmer's report, is the Hawaiian forest, which does not cover a water-producing area.

Here there is no water flow to complicate the question.

There is not only no water to conserve, but the natural growth of the forest, being more open, does not require the careful protection which the forest growing in a semi-swamp does. The undergrowth is hardier, and recovers more easily than it does in the water-soaked section.

With proper care, the mature trees can be removed, not only without radical damage to the remaining growth, but to the advantage of the younger growth, and, by opening up the under vegetation, gives opportunity for seeds to start and saplings to reach the light which otherwise would fail to germinate or die for lack of room.

It becomes simply a question of intelligent lumbering; the making of the forest a revenue-producer through the medium of lumber instead of through the medium of water.

The principle involved in both cases is the same—viz., the causing the soil to produce that which will be the most value to mankind. In the water-producing area, that which can be produced of most value is water. In the non-water producing forest, that which can be produced of most value is timber.

How to intelligently lumber forests is a question which has had expert study of a high class in most European countries, and to which great attention is now being paid in the United States. There is no mystery about it. It simply consists in intelligent application of common sense to local conditions. This has been done in Europe, and is being done in the United States. It has practically never yet been done in Hawaii.

WHAT FOREST RESERVES MEAN.

Popular opinion in Hawaii largely conceives of a forest reserve as an area which is locked up and removed from profitable enterprise.

As a matter of fact, in the case of water-producing forest, it is a devoting of the land to the production of that which is of the most value to the people of the territory—viz., water.

In the case of non-water producing forest, it means not locking up from profitable use but protecting the forest from destructive agencies, so that it can be made profitable, which now it is not, and, with a few exceptions, never has been, and, unless the methods of lumbering and reproduction evolved by study in Europe and the United States are applied here, never will be.

In other words, the most valuable crop which can be produced in a water-bearing forest is water. The most valuable crop which can be produced in a non-water producing forest is timber. Whatever will most effectively accomplish these results in the respective cases is in the public as well as private interest, and should be done.

THE MAHOGANY LUMBER COMPANY.

THIS NATURALLY BRINGS US TO THE CONSIDERATION OF THE EXTENSIVE OPERATIONS NOW BEING UNDERTAKEN BY THE HAWAIIAN MAHOGANY LUMBER COMPANY.

The proposition that Hawaii possesses forests which can produce railroad ties by the million has come as an intense surprise to all but a very few in Hawaii.

The fact that ties can be produced and exported at a profit has come as a surprise to everyone. The only possible explanation thereof is the practical lumber famine which is now upon the United States, and so graphically described in the official reports above quoted from. This shortage has for the

first time made it possible to bring home to the people of Hawaii, in cold dollars and cents, that forest production and lumbering can be made an important industry in this territory.

The fact that nearly 3,000,000 standard railroad ties are to be exported from the territory within the next five years has produced much solicitude and adverse comment among those who have not studied the question. Within the past month I have repeatedly heard the statement made that this contract was a bad thing for the territory, as it would not only denude the forest but exhaust the entire local supply of timber.

WHERE THE TIMBER WILL COME FROM.

So far from this being the case the fact is, that almost this entire contract will be filled with timber cut from the arable lands of the Olaa and Puna Sugar Companies, which, in ordinary process, they are clearing for the cultivation of sugar-cane.

Heretofore, the timber cleared from similar lands has been removed at large expense, and burned on the ground to get rid of it.

Under this contract the timber will be removed at no expense to the plantations, and a handsome stumpage will be paid to them instead.

Just how much more Ohia there is available for lumbering cannot now be definitely stated without much more careful examination than has heretofore been given to the subject, but it is entirely conservative to say that there is ten times as much more available Ohia as that involved in this contract without in any way interfering with water-conserving forests.

Comparatively little of the Ohia forest available for lumbering is suitable for cultivation. The great bulk of it is on land so rocky, or so steep, or at such elevations as to make agriculture impracticable for any products now known to be profitable.

In consequence of this fact, the great bulk of the Ohia forest land will continue to be forest land. Whether they will continue to produce only Ohia timber is a question which the future must determine, after intelligent study by forestry experts has been given to the subject. It may very well be that it will pay to substitute the slow-growing Ohia-tree, as the mature Ohia forest is removed, with the quicker-growing hardwood trees which are so easily propagated here.

NO FEAR OF FOREST DESTRUCTION.

The people of Hawaii need have no fear that the present move to make valuable the heretofore waste forests of Hawaii is a move toward denudation of the forest and the carrying on of the policy of forest destruction which has heretofore prevailed so generally.

The one railroad tie contract above referred to means that there will, within the next five years, be brought into this territory approximately 2,500,000 dollars in gold coin which, but for that contract, would never have come here.

It means that this contract will demonstrate that lumber production can be made one of our leading industries. This is with the proviso, however, that such lumbering is done under intelligent supervision and is followed up by intelligent care of the area lumbered, looking toward the protection of the young trees remaining and the propagation of additional trees.

The outlook is full of hope in this connection, for the operations of the Mahogany Lumber Company, not only in connection with its lumbering of Ohia ties but of the Koa forests, is being consistently carried out, both on the part of the forest owners and of the lumbering company, under the direct supervision and advice of the Superintendent of Forestry, and subject to the rules and regulations of the Board of Forestry.

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

TWENTY-SECOND LESSON.

THE TESTING OF MILK. SAMPLING. COMPOSITE SAMPLES. SAMPLING OF CREAM. THE BABCOCK TEST OF MILK, SKIM MILK, AND CREAM. CALCULATION OF THE YIELD OF COMMERCIAL BUTTER. BUTTER CHART.

In our last lesson we studied the composition of milk, and were told that the composition and the yield may be influenced by various factors. In order to get the best results from a dairy herd, it will be absolutely necessary to get the **yield of butter fat from every cow**, so as to be able to find out which cows give the best profit and are worth breeding from. The testing of milk for butter fat, which some years back could only be done with sufficient accuracy by trained analysts, is now, due to the invention of Dr. S .M. Babcock, a comparatively simple matter. The **Babcock test** is a practical and reliable method to ascertain the amount of *butter fat in milk, cream, skim milk*, &c. No special chemical training is required for the carrying out of the test, and any intelligent person can with care and attention to detail carry out the test and get reliable results in a few minutes. It would be, of course, of great assistance to anyone learning to test if the operations are shown to him by an experienced tester. Due to the introduction of a Government examination in the proficiency of milk and cream testing, experienced testers may be found nearly everywhere in Queensland, and even a large number of State school teachers availed themselves of opportunities to get such certificates.

The object of this lesson is to explain the methods of milk and cream testing by the Babcock tester in a short and practical manner, so that any farmer may be able to test the milk of his dairy herd. Every farmer should make it a practice to **weigh the milk** of each cow. The weighing of milk is much quicker and more accurate than measuring, as reliable spring balances are obtainable everywhere at a very small cost. By pouring the milk into a bucket the weight of which is known, once for all, the weight of the milk of any cow can be ascertained in a few minutes. From the weight the amount in gallons and quarts can be easily calculated, by remembering that 1 gallon or 4 quarts of milk weigh about 10¼ lb.

Sampling of Milk.—Before testing, the milk must be **well mixed**, as we know that the composition of the milk varies during the milking, and that the last strippings are particularly rich in butter fat. The mixing of the milk for the sample is best accomplished by pouring the whole of the milk several times from one bucket into another just before the sample is taken.

As it is not always practicable to test every cow twice a day, it is usual to collect **weekly average samples**, for which purpose so-called **composite milk test bottles** are generally used. These bottles are divided into seven equal parts, which are distinctly marked on the outside of the bottle. After the milk has been well mixed, a small quantity is taken out with a small dipper and the bottle filled up to the next mark. This is repeated every day during the week, and the milk finally tested after the seventh day. A separate bottle is used for the evening milkings, which are also tested separately from the morning's milk. If the yield of morning's and evening's milk does not differ very much, as is the case with some cows, the morning's and evening's samples may be mixed for the test, but more accurate results are obtained if

the tests are made independently, and the daily average yield calculated from the weights of morning's and evening's milk and the two average tests, as shown in a practical example later on. In order to **preserve** the composite samples, a small quantity of powdered **bichromate of potash**—about 8 grains for a composite bottle holding 8 oz., or as much as will go on a threepenny bit—is put into the bottle, and after each addition of milk the contents of the bottle are mixed by a gentle rotary motion of the bottle. At the end of the week, when the test is going to be made, the milk in the bottle is well mixed by pouring the whole contents of one bottle into another vessel and back again into the bottle, repeating this several times until the milk sample is well mixed and shows no signs of streakiness. Should any cream have separated out, and should perhaps have hardened on the surface, which may happen if the bottles are kept for a few days after the bottles are filled, it may be necessary to gently warm the bottles to about 110 degrees Fahr. for a few minutes, to let all the fat which had separated out melt, and this fat is then again incorporated with the milk by a vigorous shaking of the bottle before the sample is taken.

Sampling of Cream.—In the mixing and sampling of cream, more particularly if the cream has been standing in cans for some time, a still greater care is absolutely necessary in order to obtain a reliable average sample. Pouring the cream from one can into another is not always practicable, the stirring of the cream in the can with an ordinary stick is more than useless to get the cream mixed, and the only reliable method is by the use of a properly constructed **mixer with plunger,** so arranged that after thorough mixing of the whole contents of the can a true average sample of the mixed cream may be obtained from the whole depth of the can with the sampling tube of this plunger.

The Babcock Test for Milk.—This practical test for the determination of the amount of **butter fat** in milk and its products was invented by *Dr. S. M. Babcock,* the chief chemist of the Wisconsin Agricultural Experiment Station, nearly twenty years ago, and it is based on the action of strong sulphuric acid on the milk solids under liberation of the butter fat, and a subsequent separation of the clear fat from the serum by the aid of centrifugal force. The strong sulphuric acid acts on the solids not fat, by actually *dissolving the casein,* which at first is precipitated, and thereby destroying the agents which keep the fat in emulsion, so that the globules may now collect and run together, which condition is favoured by the great amount of heat generated by the mixing of the strong acid with the milk. The *liberated butter fat* will *rise to the surface;* this separation will again be hastened by the greater difference between the specific gravities of the fat and the milk serum, which difference, by the addition of a large amount of the heavy sulphuric acid, has become very much greater than existing in the original milk. The *separation* may be effected by letting the bottles stand for a few hours, but is very much accelerated and made much more complete by whirling the bottles in the centrifugal testing machines (testers). The centrifugal force produced by the rapid whirling acts most on the heavier constituents, the milk serum, which is forced towards the outside of the machine or towards the bottom of the bottles, whereas the lighter fat is forced towards the centre of the tester or towards the neck of the bottles. The bottles are filled up with hot water to bring the fat right into the neck of the bottles, and this column of fat is finally read off, after some more whirling, on the graduated scale on the neck.

For the carrying out of the test, the following apparatus is required:—

Test bottles, pipette for measuring milk, acid measure, a tester, sulphuric acid, which may be obtained from any of the dealers in dairy apparatus and glassware.

A strict relation must exist between the **graduation on the neck of the test bottle** and the **quantity of milk** taken for the test. The milk is measured with the aid of a pipette which holds exactly 17·6 c.c. (cubic centimetres) of milk when filled to the mark on the neck of the pipette. This quantity will, when allowed to run into the milk bottle, deliver 17·5 c.c. of milk, as a small but fairly constant quantity of milk, estimated to be 1·10 c.c., adheres to the side, and the actual quantity of milk delivered equals 18 grammes of milk, as, milk being heavier than water, 1 c.c. weighs on an average 1·03 gramme, and, consequently, 17·5 c.c. × 1·03 = 18·0 grammes. On the neck of the milk bottles we find long division marks from 0 to 10, each again subdivided into 5 parts, each representing 2/10 of a percent. If we had a milk containing 10 per cent. of fat, the 18 grammes of milk taken would contain 1·8 gramme of butter fat, which, when measured, would occupy a space of $\frac{1\cdot8}{\cdot9}$ = 2 c.c.; the specific gravity of the fat being less than that of water, only ·9, and, therefore, the neck of the milk bottle must hold between the 0 and the 10 per cent. mark exactly 2 cubic centimetres. The accuracy of bottles and pipettes has to be ascertained at the Government Agricultural Laboratory before they are allowed to be used in factories. After being tested, each piece of glassware is marked with an official stamp as a guarantee of its accuracy.

Measuring the Milk with the Pipette.—The exact measuring of the milk with the pipette requires a little practice. The milk immediately after being well mixed is sucked up into the pipette until it rises a little, say about 1 inch, above the mark on the stem of the pipette. The tip of the forefinger is now smartly placed over the opening of the pipette before the milk is allowed to run back below the mark. By slightly lessening the pressure of the finger, the milk is allowed to run out, drop by drop, until it reaches exactly the mark on the stem, the flow then being stopped by again pressing the finger hard down. This running down of the milk to the mark requires some practice, and it will be found that it only can be accomplished if the *tip of the finger is fairly dry*. Some operators work the pipette without the finger, and close the opening of the pipette with the tip of their tongue as soon as the milk has reached the mark, and keep the pipette in the mouth until the milk is transferred to the test bottle. Others, again, who, on account of rough skin on their finger tips, never succeed in running the milk down to the mark, use a finger of the left hand to close the bottom opening of the pipette, and try to get the right quantity by working with the two fingers. If the pipette before

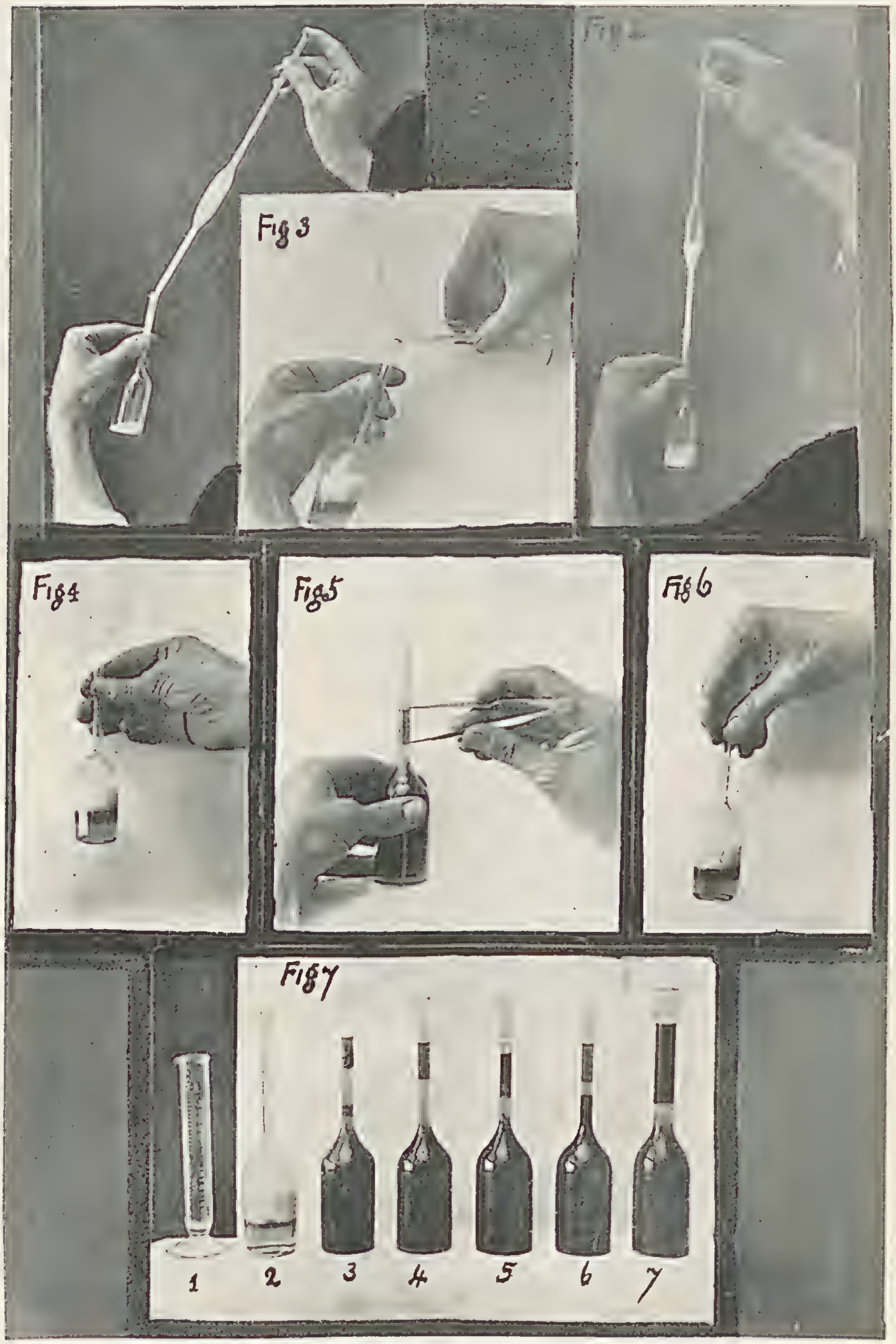
being filled with the milk is not absolutely dry, it must be rinsed out with the milk itself, by filling the pipette with milk and allowing this first filling to run away, and then take up the proper sample. In the same manner when different samples of milk are to be tested one after the other, the pipette is not washed out with water, but only rinsed out once with the sample of milk to be tested; this pipette-full is thrown away, and the second filling taken for the test. The pipette-full of milk is now moved towards the test bottle, taking care that no milk is allowed to run out by keeping the finger well pressed down, and the point of the pipette is placed into the neck of the test bottle, and is *held in an oblique position* (as shown in Fig. 1 of Plate XVII.), and the milk allowed to run slowly down the neck of the bottle, by releasing slightly the pressure of the forefinger. It is quite wrong to push the point of the pipette right down the neck of the bottle (Fig. 2), both bottle and pipette being held perpendicular, as there is always a chance of milk being lost by running over the neck. Not a drop of milk must be lost during this transfer from pipette to bottle, and when all the milk has run out the few drops collecting at the point of the pipette are blown gently into the test bottle.

Adding the Acid.—Commercial sulphuric acid (oil of vitriol), of a specific gravity of from 1·82 to 1·825, should be used for the test, and for each test 17·5 c.c. are required. The acid is measured out with the acid measure, which is filled up to the mark. When a large number of tests have to be made it is more convenient to use a special burette, holding enough acid for twelve or more tests. When adding the acid to the milk in the bottle, the bottle is held again in an inclined position, and the acid is allowed to flow down the neck of the bottle (*see* Figure 3). The bottle is at the same time slowly turned round so that all the milk in the neck of the bottle is washed down by the acid. In order to get good tests, the **temperature of milk and acid** should be about **70 degrees Fahr.**, as too high a temperature will produce the same effect as the use of too much or of *too strong an acid*, which is to give a dark appearance to the fat column, and also produces charred, dark-coloured specks floating about just under and sometimes in the fat. If milk and acid are *too cold*, or the acid *too weak*, the action is not vigorous enough, some of the casein may be left undissolved, producing white specks and a cloudy appearance of the fat and often a peculiar milky layer just under the fat column. The appearance of the finished test will show if the test was properly carried out; the fat column ought to have a bright yellow colour, be perfectly transparent, show no cloudiness between fat and serum, and contain no floating white or black specks in fat or in serum. In illustration 7 of Plate XVII., Fig. No. 3 shows a test with too little acid, No. 4 a good test, and No. 5 is a test with too much acid.

The acid as received from the manufacturers is generally too strong, and instead of attempting to add water to reduce the strength, or by leaving the bottle standing with the stopper out so as to let the acid absorb moisture from the air, it is much more convenient to use a smaller quantity of acid, which quantity is easily ascertained by a few preliminary tests. For this purpose the firm of Messrs. J. and W. Wilson, Wharf street, Brisbane, have constructed, on my recommendation, a special acid measure, graduated from 10 c.c. upwards to 17·6 c.c. (No. 1 of Figure 7, Plate XVII.), so that any desired quantity of acid may be measured off. It will be found that from 12 to 15 c.c. of ordinary strong acid are generally sufficient to give good clear tests.

Mixing the Milk and Acid.—When the acid is added to the milk in the proper manner, both should form distinct layers in the test bottle (No. 2 of Fig. 7) without much discolouration between. The bottles may be left standing in this state until the whole number of tests have been measured out. The bottles must now be shaken with a rotary motion, and it will be found that the clearest tests are obtained if at first a couple of quick semi-circular motions are given to the bottle, so as to mix the acid and milk rather suddenly, and then to continue the mixing by a gentle rotary motion of the milk bottle. The bottles must not be shaken in such a manner that the liquid splashes into the neck of the bottle, and the bottle should be held so that in case of accident the

Plate XVII.



TESTING OF MILK AND CREAM.

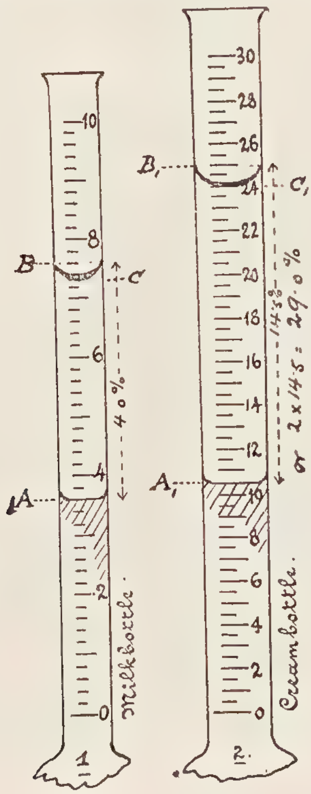
liquid does not touch the hands or the body (Fig. 4), and should never be held like shown in Fig. 6. The solution in the bottle turns at first yellow, then brown, and finally a dark chocolate brown. Too black a colour shows additions of too much or too strong an acid. A peculiar purple colour is sometimes produced if the milk should have been adulterated by the addition of the preservative formalin.

The test bottles may now be left standing for a few minutes before being whirled, and may be left standing even for days without being spoiled, but in this case they will have to be heated up again, before whirling, by placing them for a quarter of an hour into hot water of a temperature of 170 degrees to 180 degrees Fahr., and mixing well again before putting them into the tester.

Whirling the Bottles.—The bottles are now placed into the buckets of the centrifugal machine (tester), and whirled at the rate of 600 to 1,200 revolutions per minute, according to the size of the machine. A tester with a diameter of 18 inches requires about 800 revolutions. The buckets of the small two or four bottle hand testers are generally made much larger, and are so arranged that they can be filled with hot water, to keep the bottles hot. It is important to note that always an even number of bottles should be put into the tester, and they should be placed in pairs diametrically opposite to each other, so that the load is evenly distributed. The **first whirling** is continued for about **4 to 5 minutes.** It will now be noticed that all the fat has risen to the top of the liquid in the bottles.

Adding Hot Water.—Clean hot water, if possible rain water or distilled water, at a temperature of about 160 degrees, is now added to the liquid in the bottle, until the contents reach the lower end of the neck of the bottle, and the bottles are now fugalled for a **second time** for **2 minutes.** The bottles are taken out, and more hot water is now very carefully added until the fat rises into the neck of the bottle, nearly reaching the 10 per cent. mark. The whirling is now repeated a **third time** for **1 minute** at full speed.

Reading the Fat Column.—The fat column in the neck is now read off with



the aid of a pair of dividers held in the right hand (Fig. 5), so that the points of the dividers touch the highest and lowest points of the column; and by reading off the actual length by shifting the lower point of the dividers down on the zero mark, the other point will indicate the actual percentage of butter fat in the milk.

It will be noticed by a careful examination of the fat column that the lower line of division between fat and water is an almost straight line (marked A on milk scale), whereas the upper line forms a distinct curve, which must be read off at its highest point B, and not on its lowest point C, or any other point between. When reading the column the bottles must be still hot, and should have a temperature of 130 to 140 degrees. Should the bottles be cold, they must be put into hot water of 140 degrees for a few minutes before the fat column is measured.

As soon as the tests are completed, the bottles, whilst still hot, are emptied out and well washed with hot water containing a little soda.

Recapitulation of the operation of milk testing:—

1. *Mix sample of milk thoroughly and cool, if possible, to about* 70 *degrees.*
2. *Fill pipette to the mark and run into milk bottle distinctly marked with the number of the test.*
3. *Make a second duplicate test of the same sample.*
4. *Fill acid measure with the necessary amount of sulphuric acid, and add carefully to the milk.*
5. *Mix the acid and milk thoroughly, allow to stand for a few minutes and mix again.*
6. *Whirl in tester at full speed for* 4 *minutes.*
7. *Add hot water up to neck and whirl for* 2 *minutes.*
8. *Add hot water until fat nearly reaches the* 10 *per cent. mark, ana whirl again for* 1 *minute.*
9. *Read off result whilst bottles are still hot (about* 140 *degrees).*
10. *Read each test twice to make sure of result, and read duplicate test, which should agree to within* $\frac{1}{10}$*th per cent.*

One of the great drawbacks in the use of the Babcock test is the necessity of handling the rather dangerous strong sulphuric acid; this difficulty has been overcome by a new test patented by Sichler a few years ago, which is called the "*Sinacid test*," and in which the acid is replaced by an alkaline solution, and the separation of the fat aided by the addition of a very small quantity of isobutyl-alcohol. (No. 6 of Fig. 7 shows a milk test made with the new test.)

Calculation of Yield of Butter.—From the weight of the milk and its test the yield of commercial butter may be easily calculated. First, a small deduction has to be made from the percentage of fat for the unavoidable **loss** during **separating** (loss of fat in the skim milk) and **churning** (loss of fat in the butter milk), which loss, as found from numerous practical tests, amounts to about ¼ per cent. Again, an allowance has to be made for moisture and salt in the finished butter, and it is estimated that 85 lb. of butter fat produce about 100 lb. of commercial butter.

Example 1.—A cow gives on an average 31 lb. of milk daily, with an average test of 3·8 per cent. fat, what is the yield of commercial butter?

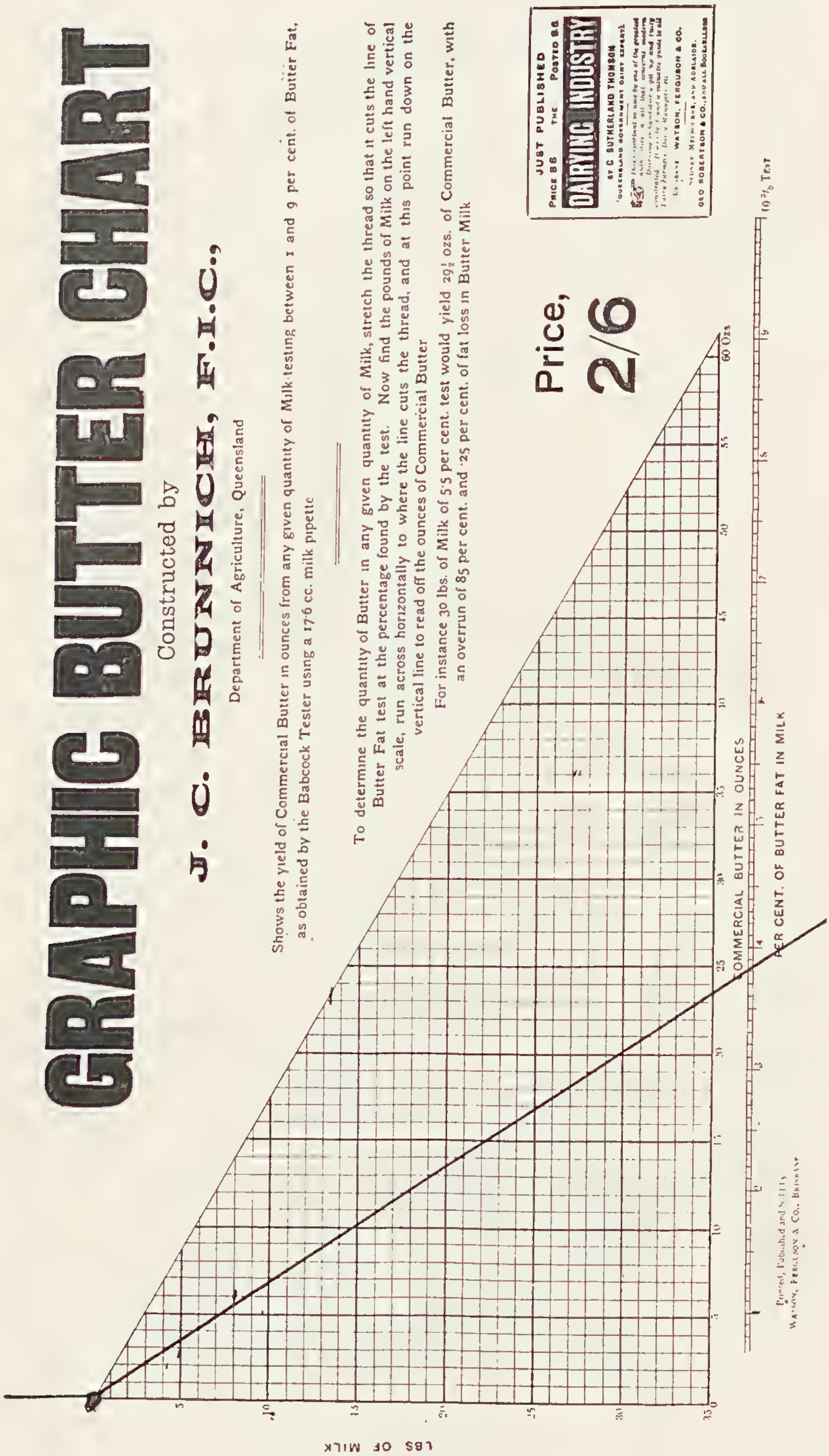
Answer.—

$$3{\cdot}8\ \% - {\cdot}25\ \% = 3{\cdot}55\ \%$$

$$\frac{3{\cdot}55 \times 31 \times \cancel{100}}{85 \times \cancel{100}} = 1{\cdot}295 \text{ lb., or}$$

$20\frac{3}{4}$ oz. commercial butter.

Plate XVIII.


GRAPHIC BUTTER CHART
Constructed by
J. C. BRUNNICH, F.I.C.,
Department of Agriculture, Queensland
Shows the yield of Commercial Butter in ounces from any given quantity of Milk testing between 1 and 9 per cent. of Butter Fat, as obtained by the Babcock Tester using a 17·6 cc. milk pipette
To determine the quantity of Butter in any given quantity of Milk, stretch the thread so that it cuts the line of Butter Fat test at the percentage found by the test. Now find the pounds of Milk on the left hand vertical scale, run across horizontally to where the line cuts the thread, and at this point run down on the vertical line to read off the ounces of Commercial Butter
For instance 30 lbs. of Milk of 5·5 per cent. test would yield 29½ ozs. of Commercial Butter, with an overrun of 85 per cent. and ·25 per cent. of fat loss in Butter Milk
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60 Ozs
PER CENT. OF BUTTER FAT IN MILK
10 % TEST
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This calculation may be avoided by using one of my **graphic butter charts**, in which the amount of commercial butter in ounces may be read off, amount of milk in pounds, and per cent. of fat being given.

The chart is illustrated on Plate XVIII., and is set for a test of 3·8 per cent., the thread (the heavy diagonal line) is stretched so as to cut the scale of per cent. of fat at the point 3·8. The quantity of milk is found on the left-hand perpendicular scale, and the line is followed across horizontally until where it cuts the thread, and the result of commercial butter is read off by following a perpendicular line from this point of section down. We see that 31 lb. of milk will give nearly 21 oz., or, accurately read off, $20\frac{3}{4}$ oz. commercial butter.

According to *O'Callaghan's chart*, which is used in some dairies, the result would be for same amount of milk of the same test 1·31 lb. or just 21 oz.

Example 2.—A cow gives during the week the following amounts of milk in lb. :—

	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.	Total.
Morning ...	24	25	22	$25\frac{1}{2}$	24	$26\frac{1}{2}$	27	174
Evening ...	16	17	$15\frac{1}{2}$	17	14	15	$13\frac{1}{2}$	108

and the composite samples of the morning milk gave 4·2 per cent., and of the evening milk 4·55 per cent. of fat. What is the daily average yield of commercial butter?

Answer.—The average daily morning yield is :—

$$\frac{174}{7} = 24{\cdot}85 \text{ lb. @ } 4{\cdot}2\ \% = 18\tfrac{1}{2} \text{ oz.}$$

Evening yield $$\frac{108}{7} = 15{\cdot}40 \text{ lb. @ } 4{\cdot}55\ \% = 12\tfrac{1}{2} \text{ oz.}$$

Average daily yield = 31 oz.

A full, accurate calculation would give for the week :—

From morning's milk	8·086 lb.	commercial butter
From evening's milk	5·464 lb.	,, ,,
Total	13·550 lb.	,, ,, or

$$\frac{13{\cdot}55}{7} = 1{\cdot}94 \text{ lb.} = 31 \text{ oz. daily.}$$

Testing of Skim Milk.—Special forms of double-necked test bottles are used for the testing of skim milk, in which the tube in which the fat has to be read off is of very narrow diameter, and a special neck or opening is used for the running in of milk and acid. The ordinary style of skim milk bottle has generally ten divisions, each representing ·05 or $\frac{1}{20}$ per cent. of fat, the whole ten divisions being consequently equal to $\frac{1}{2}$ per cent. of fat.

Other bottles, again, are marked off into $\frac{1}{100}$ per cent., from 0 to $\frac{25}{100}$ per cent. of fat.

In the testing itself the time of whirling should be a few minutes longer, and a larger amount of acid up to 20 c.c. may be used with advantage to get good tests.

Testing of Cream.—For the testing of cream special cream bottles are used, which have a much wider neck, bearing graduation from 0 to 30 per cent., each division again divided into halves, and in some special bottles into $\frac{1}{5}$ of per cent. The pipette used for the ordinary testing should hold 8·8 c.c. of cream, but for accurate work for all the tests the cream should be weighed into the bottles. The specific gravity of cream is less than that of milk and of water, and, therefore, 8·8 c.c. does not represent 9 grammes of cream. Fresh separated cream containing about 25 per cent. of fat has a specific gravity of 1·002, or practically the same as water, and cream of 35 per cent. fat standard has a specific gravity of ·98, 50 per cent. fat a specific gravity of only ·95, so that when testing a 50 per cent. cream only 8·8 × ·95 = 8·36 grammes of cream are taken for the test, so that the result of fat by measuring found to be 48·5 per cent. should really be—

$$\frac{48{\cdot}5 \times 9}{8{\cdot}36} = 52{\cdot}\dot{2} \text{ per cent. of fat.}$$

The specific gravity of cream after standing increases gradually by minute air bubbles escaping, and the practical results of ripe cream will not differ quite so much. O'Callaghan in his chart states that a 48·5 per cent. test by measuring would correspond to a true test of 50·36 per cent., and the actual true result would fall between 50·8 per cent. and 52·2 per cent., according to the age of the cream.

The cream, after having been sampled in the most careful manner, in the case of the cream being lumpy, a slight warming to about 110 degrees will be required, the cream pipette is rinsed out once or twice with the cream to be tested, finally filled up to the mark in the usual manner, and cream run into the test bottle. Now warm water of about 110 to 120 degrees Fahr. is drawn into the pipette, taking care that none of the cream adhering to the sides of the pipette is allowed to run into the water. This may be avoided by holding the pipette, after emptying the cream into the bottle, upside down for a few moments and then to start sucking as the point of the pipette is brought into the hot water. The water is drawn up as near as possible to the mark, but no attempt is to be made to let some of the water out to get it absolutely to the mark. Now part (about $\frac{1}{4}$) of the pipette full of water is run into the cream bottle, then the pipette is closed top and bottom with the forefingers of right and left hand, and well shaken so as to get all the cream washed off the sides, and the whole run into the test bottle on top of the cream. The test bottle contains now 8·8 c.c. of cream and about 8·8 c.c. of water, the contents are well mixed, and the acid added. Generally less acid is required than for milk, and from 11 to 15 c.c. give good tests. Mixing the acid with the cream, whirling, filling up is done exactly the same as with milk. After reading off, the final result has to be multiplied by two to get the actual percentage of fat in the cream. On the figure in test illustrating the fat column in a cream bottle, which has to be read from A_1 to B_1, as equal 14·5 per cent., the result would be 29·0 per cent. of fat. As the results are multiplied by two, special careful reading is necessary.

The use of dividers is strongly recommended in the reading off, as without it mental calculations, as in the example 25·0 – 10·5 = 14·5, have to be made, in which subtraction errors are easily made.

Example 3.—What amount of cream and skim milk should be obtained from a given quantity of milk of certain tests?

Answer.—100 lb. of milk testing 4·5 per cent. are separated to give a cream of 30 per cent. test. The quantity of cream is found by dividing the percentage of fat in milk by percentage of fat in cream and multiplying result by the weight—

$$\frac{4{\cdot}5}{30} = {\cdot}15 \quad ; \quad {\cdot}15 \times 100 = 15 \text{ lb. of cream of 30 per cent test,}$$

and consequently 100 – 15 = 85 lb. of skim milk.

An excellent little book on "Modern Methods of Testing Milk and Milk Products," by L. van Slyke, 1907 ed., can be recommended to anyone requiring fuller information and instruction on this important subject.

QUESTIONS TO TWENTY-SECOND LESSON.

1. What are the principles of the Babcock test?
2. What precautions have to be observed to get true average samples of milk and cream?
3. Describe briefly the operations in doing a milk test.
4. How does different strength of acid affect the tests?
5. What should be the appearance of the fat column if the test is properly carried out?
6. How has the fat column to be read off?
7. Why is 17·6 cc. chosen as the size of the milk pipette?
8. Why are different results obtained when cream is tested by measuring or by weighing out?
9. Describe the process of testing cream by the Babcock test.
10. Why does a certain quantity of fat in cream produce a larger amount of commercial butter?

Science.

THE DIVINING ROD.

That many persons are able, with almost absolute certainty, to not only indicate the presence of water underground, but also to determine the depth at which it will be found, has long been beyond the region of doubt. In our own State of Queensland the services of a water-finder are frequently employed before proceeding to sink a well or start a bore, and success has nearly always attended the diviner's work. On the explanation of the action of the divining rod the "Indian Trade Journal" says:—

We believe no one has ever brought forward a satisfactory explanation of the fact that some few individuals can locate water underground, while the great majority cannot. Some of the best and most practical of our scientific contemporaries have seriously discussed the performances of the "water-finder" and his "divining rod." Among skilled engineers there are at least as many who do believe in him as those who do not. The general explanation of the believers is expressed by the word "magnetism," certainly vaguely, but no more so perhaps than by the use of the word in connection with the cure of disease, for example. But a great step forward has recently been made by a Swiss inventor, who has produced an instrument which indicates the presence of water below ground in a remarkable manner. There is every reason to believe that in some way it is dependent upon electrical currents, for there are within it certain coils of wire and a needle pointer reminding one of a galvanometer. The instrument is placed upon the ground. If there be no water near, the pointer remains stationary. If there be water, the pointer vibrates more or less, varying with the amount and proximity of the spring. The vibration of the pointer is such as to indicate also in which direction the water lies, so that by moving the instrument from place to place the exact position for well-sinking can be readily ascertained. The instrument is said to be as efficient in locating oil as water, and that the only case in which it fails to work satisfactorily is in proximity to veins of ironstone. The instrument is light and portable, and should prove invaluable to prospectors and colonists. Messrs. Mansfield and Co., of Creewood Buildings, Brunswick street, Liverpool, have secured the sole agency for its sale in Great Britain and British colonies.

POISONING CROWS.

A correspondent at Hapsburg, Isis, writes as follows in defence of the crows:—

"In your February Journal you give a recipe for killing crows. In the name of all that is sensible, keep every bird we can alive in this country. Those same crows are a God-send up here. Last year I had no end of grubs, and some 200 or 300 crows used to follow my ploughs, eating off their heads, as the bodies of the grubs are too squashy. On the Johnstone we had very few birds of any description, and the grubs were worse than I have ever seen them. No. Advise every cane farmer to cultivate the breeding of crows and all insect-eating birds."

[Of course there are two sides to every question, and what is looked upon as a pest by one class of producer is considered a God-send by another. Rabbits in Queensland are a serious pest, but in Victoria and New South Wales they are turned to commercial profit, and afford profitable employment to thousands of rabbiters. We should think that the ibis would do for the cane farmer as much as the crows, without inflicting injury on other primary industries. Our correspondent's demand for the preservation of all insect-eating birds is in accordance with common sense.—Ed. "Q.A.J."]

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1907.											1908.	
	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
North.													
Bowen	3·74	1·97	0·39	3·46	2·87	Nil	1·28	0·51	0·06	3·71	6·39	10·14	5·63
Cairns	11·49	3·26	3·35	8·65	4·45	0·12	0·39	1·35	0·68	5·35	28·33	27·02	8·03
Geraldton	25·26	4·58	6·08	21·91	8·54	2·39	4·66	1·36	1·42	6·45	33·82	44·39	13·27
Herberton	11·77	2·05	0·90	1·57	2·71	Nil	0·11	0·12	0·17	3·41	9·57	9·29	5·02
Hughenden	3·83	1·17	0·16	1·34	0·95	1·16	Nil	Nil	1·66	0·66	7·75	0·98	5·18
Kamerunga State Nurs.	14·82	4·87	2·80	9·33	5·29	0·13	1·15	1·19	0·53	2·76	29·82	...	7·47
Longreach	0·49	1·88	0·85	0·93	[illegible]	0·49	0·04	Nil	1·08	2·83	9·12	Nil	4·07
Lucinda	23·82	4·53	3·92	19·29	6·34	0·29	1·05	1·19	0·25	0·43	23·38	25·93	13·04
Mackay	6·42	8·01	1·58	6·09	5·04	0·27	0·25	0·12	0·12	5·76	9·70	9·28	3·83
Rockhampton	4·42	3·05	0·41	0·94	4·16	0·84	0·47	Nil	0·47	3·72	4·42	3·84	9·64
Townsville	7·75	7·37	1·03	3·11	2·38	Nil	0·07	0·14	0·03	2·82	24·26	12·21	6·69
South.													
Barcaldine	0·43	1·51	0·82	0·34	2·03	0·87	0·06	Nil	1·21	1·54	11·74	Nil	5·73
Beenleigh ...	3·88	4·17	0·58	4·70	4·92	0·71	0·58	Nil	1·73	2·81	4·48	2·41	9·41
Biggenden State Farm	3·55	10·91	0·34	4·02	5·24	1·51	0·96	0·24	1·99	2·50	5·55	...	9·82
Blackall	Nil	2·78	1·69	0·20	0·36	1·36	0·06	Nil	0·88	0·80	7·47	0·63	7·02
Brisbane	5·23	5·32	0·45	4·75	2·91	0·39	0·79	0·10	1·37	4·25	3·21	2·80	8·43
Bundaberg	3·90	12·81	0·38	3·08	4·49	0·57	0·43	Nil	1·70	2·90	2·99	4·77	2·82
Caboolture	8·03	9·04	0·78	3·10	4·98	0·73	0·32	0·13	2·09	4·15	3·18	9·36	18·06
Charleville	Nil	2·75	2·29	0·26	0·90	1·04	0·76	0·02	1·69	3·88	4·09	0·32	1·67
Dalby	1·34	3·72	0·20	2·26	2·35	0·87	0·71	0·15	0·69	5·18	1·44	0·17	4·88
Emerald	3·67	7·66	Nil	Nil	2·53	1·75	0·10	Nil	0·98	1·84	6·70	0·49	10·85
Esk	6·79	3·60	0·22	5·42	2·06	0·54	0·81	0·57	0·50	3·76	3·72	2·61	10·06
Gatton Agric. College	6·44	2·71	Nil	2·80	1·85	0·54	0·56	0·15	0·71	3·01	4·55	...	3·38
Gayndah	1·91	6·89	Nil	2·65	3·00	1·21	0·53	0·40	0·34	4·65	6·84	1·22	8·33
Gindie State Farm ...	0·71	10·10	Nil	Nil	2·29	1·58	0·10	0·16	0·61	1·57	4·42	0·20	7·17
Goondiwindi	1·77	6·51	0·33	1·30	1·09	1·62	0·95	0·12	1·13	2·91	3·71	1·22	4·23
Gympie	6·96	8·93	1·12	3·84	3·77	0·80	0·17	0·47	1·20	3·05	5·49	6·26	11·77
Ipswich	5·38	1·95	0·12	3·43	2·22	0·30	0·43	0·05	0·78	4·45	3·40	1·32	6·63
Laidley	4·50	3·47	Nil	2·99	1·56	0·15	0·58	0·15	0·87	1·97	2·72	1·61	5·80
Maryborough	7·84	10·28	1·25	3·21	6·05	0·64	0·93	0·25	2·74	3·49	5·81	5·62	8·07
Nambour	12·05	13·30	1·36	4·54	6·96	1·08	1·13	0·60	1·38	2·98	4·76	9·29	15·16
Nerang	6·04	7·83	1·48	7·74	5·08	1·26	1·35	0·05	0·86	3·88	4·51	3·83	9·14
Roma	2·92	1·87	0·42	0·27	2·47	1·03	0·42	0·04	1·04	3·70	2·51	0·01	6·38
Stanthorpe	3·30	5·98	1·68	1·79	2·44	1·06	1·65	0·13	1·30	5·03	3·46	0·60	4·09
Tambo	1·41	3·58	3·69	0·11	0·89	1·42	0·09	Nil	0·68	2·03	7·20	0·36	4·87
Taroom	1·10	1·86	Nil	1·01	3·76	0·70	0·04	0·10	0·67	6·82	3·79	0·20	7·51
Tewantin	15·83	11·45	1·87	7·16	7·61	1·48	0·95	0·55	1·05	3·12	7·38	10·42	12·47
Texas	4·55	6·16	0·65	0·93	1·62	1·31	0·87	0·07	1·83	2·78	2·15	1·57	6·89
Toowoomba	4·00	4·81	0·01	4·61	3·34	0·91	0·65	0·17	1·58	5·12	2·81	1·16	7·66
Warwick	2·52	5·71	0·51	1·58	1·27	1·16	1·37	0·01	1·37	3·25	3·13	0·76	4·52
Westbrook State Farm	2·91	5·13	0·02	2·53	2·53	1·04	1·78	Nil	1·08	4·76	3·23	...	...

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered approximate only.

GEORGE G. BOND,
Divisional Officer.

[The figures for Kamerunga, Biggenden, Gatton College, and Westbrook are now supplied direct to the Department by the officers in charge of those institutions.—Ed. "Q.A.J."]

General Notes.

MANUFACTURE OF PINEAPPLE JUICE.

During the manufacture of canned pineapples a very large amount of refuse in the form of peelings and trimmings collects in the factory, which raw material is at present allowed to go to waste, and its disposal is quite a nuisance to the factories. Early last year the Agricultural Chemist prepared a few bottles of pineapple juice, which were opened after having been kept for twelve months, and the juice was found to be of excellent quality, having kept its pure flavour of the fresh fruit. The complete success of the experiment encouraged the Department of Agriculture and Stock to experiment on a larger scale, so as to prepare about a gross of pint bottles of pure pineapple juice from waste materials only, for the Franco-British Exhibition. Messrs. Hargreaves and Sons, of Tingalpa, were good enough to allow us the use of their manufacturing plant, and also supplied the raw material, the peelings of barely a couple of hours' work. The peelings have to be worked up at once, as even after a few hours' keeping fermentation would set in, which must be avoided to get a juice absolutely pure, possessing a fine flavour, and which is free from alcohol and preservatives. The demand for such pure fruit juices in Europe and elsewhere has enormously increased of late years, and our pineapple juice should be a successful rival of such drinks prepared from other fruits. The juice may be used in its pure state, or may be diluted with water, according to taste, or, again, could be aerated, and make a sparkling, palatable, and nutritious drink.

The peels are passed through some sort of pug mill, and then are pressed in a strong press. The juice is run through a sieve or cloth to remove any floating matter, and is then heated in a suitable boiler to about 170 degrees Fahr., and kept at that temperature for about half an hour. This heating pasteurises the juice by destroying all micro-organisms, and at the same time coagulates some of the impurities, which easily settle down on standing.

The hot juice is drawn off into a clean cask, which is covered up and allowed to stand for about twelve hours to settle, and the clear juice syphoned off. The drawn-off clear juice is again heated to 170 degrees Fahr., and bottled whilst hot and corked at once. The filled bottles have again to be heated after having been kept for twenty-four hours, which is best accomplished and does away with further handling by placing them into a wooden steam chest, where they can be gradually heated to 165 degrees, and kept at that temperature for about half an hour. The right temperature is ascertained by placing a thermometer right into the centre of a bottle of the same size filled with water, and placed in the centre near the top of the chest, so that the thermometer projects through the top of the steam box. This heating is repeated after another twenty-four hours' standing, which completes the treatment.

This process of repeated heating to 165 degrees Fahr. with twenty-four hours' interval, absolutely sterilises the juice, so that it will keep indefinitely, preserving at the same time the fine fruity flavour, as the juice was never actually boiled. A small amount of sugar may be added to the juice if the pines are not very sweet, and in the manufacture of such juice on a large scale, the juice drawn off from the settling cask or tank may be filtered by some suitable apparatus in order to get it absolutely clear.

VICTORIA AND IMPORTED PINEAPPLES.

Advice has been received from Victoria by the Department of Agriculture and Stock, that in future a charge of 1d. per case will be made by the Victorian Department of Agriculture for the inspection of imported pineapples.

LOCUSTS AND ZINC SHEETS—AN INGENIOUS DEVICE.

Locusts having of recent years increased alarmingly in the Argentine Republic, and done enormous damage to the wheat, maize, and linseed crops, the Government determined last year to take steps for the destruction of the pest. As a result of the expert advice which it obtained, it was decided to make a novel experiment. The Argentine Government placed an order with the United Silesian Zinc Rolling Mills for 5,000 tons of zinc sheets. The works securing the order were new to this trade, but they managed to make a very good record in the matter of deliveries, the first lot of 450 casks (22½ tons) leaving Hamburg for Buenos Ayres on 27th May, and regular shipments being made at a few days' interval to there and to Rosario. It seems curious to speak of zinc sheets being used for the extermination of locusts, but really there is nothing very strange about it. The sheets are up-ended, embedded in the ground, and placed in a line running across country, a trench being dug on either side of the sheet. When a locust swarm alights it eats its way along until it reaches the barrier of zinc sheets. Owing to the greasy surface of the metal, the insects are unable to scale the sheets, and the result is a dense accumulation in the trench. Then, by the aid of a few tins of kerosene and the application of a match, a holocaust is produced, and the sheets remain unimpaired, ready for the next onslaught. Galvanised sheets have also been used for the same purpose, but, although they are much less expensive than are zinc sheets, they do not answer the purpose so well, besides which they suffer deterioration from exposure, which is not the case with zinc sheets. The idea of using this material is quite a novelty. In Northern Africa, where swarms of locusts are a perennial scourge, American cloth has been used in the same way with some success, the shiny surface affording no foothold to the adventurous *Orthopteræ*, whose doom is hastened by the judicious use of the kerosene can.

Times of Sunrise and Sunset at Brisbane, 1908.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·56	6·45	5·20	6·42	5·41	6·20	5·57	5·46
2	4·57	6·46	5·21	6·42	5·41	6·19	5·58	5·45
3	4·58	6·46	5·22	6·41	5·42	6·18	5·58	5·44
4	4 58	6·46	5·23	6·41	5·43	6·17	5·59	5·43
5	4·59	6·46	5·23	6·40	5·43	6·16	6·0	5·41
6	5·0	6·47	5·24	6·40	5·44	6·15	6 0	5·40
7	5·0	6·47	5·25	6·39	5·44	6·14	6·1	5·39
8	5·1	6·47	5·26	6·38	5·45	6·13	6·1	5·38
9	5·2	6·47	5·26	6·38	5·45	6·11	6·2	5·37
10	5·2	6·47	5·27	6·37	5·46	6 10	6·2	5·36
11	5 3	6·47	5·28	6·36	5·46	6·9	6·3	5·35
12	5·4	6·47	5·29	6·36	5·47	6·8	6·3	5·34
13	5·5	6·47	5·29	6·35	5·47	6·7	6·4	5·33
14	5·6	6·47	5·30	6·34	5·48	6·6	6·4	5 32
15	5·6	6·47	5·31	6·33	5·49	6·5	6·5	5·31
16	5·7	6·47	5·31	6 33	5·49	6·4	6·5	5·30
17	5·8	6·47	5·32	6·32	5·50	6·3	6·6	5·29
18	5·9	6·47	5·33	6·31	5·50	6·2	6·6	5·28
19	5·10	6·47	5·34	6·30	5·51	6·1	6·7	5·27
20	5·10	6·47	5·34	6·29	5·52	5·59	6·7	5·26
21	5·11	6·46	5·35	6·28	5·52	5·58	6·8	5·25
22	5·12	6·46	5·36	6·28	5·53	5·57	6 8	5·24
23	5·13	6·46	5·36	6·27	5·53	5·56	6·9	5·23
24	5·14	6·46	5·37	6·26	5·54	5 55	6·9	5·22
25	5·14	6·45	5·38	6·25	5·54	5 54	6·10	5·21
26	5 15	6·45	5·38	6·24	5·54	5·53	6·11	5·20
27	5·16	6·45	5·39	6·23	5·55	5·52	6·11	5·20
28	5·17	6·44	5·39	6·22	5·55	5·50	6·12	5·19
29	5·18	6·44	5·40	6·21	5·56	5·49	6·12	5·18
30	5·19	6·43	...	...	5·56	5·48	6·13	5·17
31	5·19	6·43	...	...	5·57	5·47	...	...

PHASES OF THE MOON.

		H. M.
4 Jan.	● New Moon	7 43 a.m.
10 „	☾ First Quarter	11 53 p.m.
18 „	○ Full Moon	11 37 „
27 „	☽ Last Quarter	1 1 a.m.
2 Feb.	● New Moon	6 36 p.m.
9 „	☾ First Quarter	2 27 „
17 „	○ Full Moon	7 5 „
25 „	☽ Last Quarter	1 24 „
3 Mar.	● New Moon	4 57 a.m.
10 „	☾ First Quarter	7 42 „
18 „	○ Full Moon	0 28 p.m.
25 „	☽ Last Quarter	10 32 „
1 Apr.	● New Moon	3 2 p.m.
9 „	☾ First Quarter	2 32 a.m.
17 „	○ Full Moon	2 55 „
24 „	☽ Last Quarter	5 7 „

Answers to Correspondents.

DRYING OFF A COW.

Dairyman, Wycarbah.—

Cows are dried off by checking the activity of the mammary glands, which follows when the milk is not thoroughly taken away from the udder. Therefore, do not milk clean—that is to say, leave some milk in the vessel after each milking, and when the flow has lessened milk once a day until the cow is dry. A cow should be dried off from two to three months before calving.

WHEAT IN THE STACK.

Farmer, Westbrook.—

We are not aware that Queensland farmers keep wheat for any length of time in the stack before threshing. Many could not afford to do so, even to wait for a rise in price, and those who could afford to wait think it more sensible to realise promptly and put the money to good use on the farm. All we can tell you is that there is a wheat stack in England nearly thirty years old, the grain being still in good condition. For the benefit of yourself and other readers we reproduce this stack from the "Mark Lane Express" (18th November, 1907:—

A Remarkable Wheat Stack.

The wheat stack shown above has been standing in its present position for close upon thirty years. It belongs to Mr. Philip Selby, and is to be seen in his stackyard at Aisby, a few miles from Grantham. The stack can undoubtedly claim the distinction of being the oldest of its kind in the world. It is said that the reason it has never been threshed is because the owner once made a vow that he would not sell the grain under a certain price, which it never attained. It is black with age, but the grain is in good condition. It is said that there is not a rat in the stack; the holes seen in the picture have been made by birds.

16

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	FEBRUARY. Prices.
Apples, Imported, per quarter-case	2s. to 2s. 6d.
Apples, New England, per packer	...
Apples, Tasmanian, Cooking	6s. to 8s. 6d.
Apricots, Local, per packer	...
Bananas, Fiji, per case	...
Bananas, Fiji, per bunch	...
Bananas, Queensland, per case	...
Bananas, Queensland, per bunch	4d. to 2s.
Cocoanuts, per bag	...
Custard Apples, per quarter-case	4s. to 6s.
Grapes, per lb.	2d. to 5d.
Lemons (Lisbon), per case	3s. to 7s. 6d.
Lemon, rough, per case	1s. 3d. to 2s. 3d.
Mangoes, Queensland, per packer	...
Nectarines, per box	...
Oranges, Imported, per case	20s. to 22s. 6d.
Passion Fruit (Local), choice, per half-case	...
Passion Fruit, medium, per half-case	...
Passion Fruit, small, per half-case	...
Papaw Apples, per quarter-case	2s. to 2s. 6d.
Peaches, per quarter-case	5s. to 6s.
Peanuts, per lb.	...
Pears, per quarter-case	7s. to 8s.
Persimmons, per case	...
Pineapples (Queensland), Queen, per dozen	1s. 3d. to 3s. 6d.
Pineapples (Queensland), rough, per dozen	1s. to 1s. 6d.
Pineapples, smooth, per dozen	1s. 3d. to 3s.
Plums, per quarter-case	5s. to 6s.
Quinces, per gin case	6s.
Rockmelons, Local, per gin case	...
Tomatoes, Local, per box	1s. 6d. to 3s.
Watermelons, Local (large), per dozen	...
Watermelons (medium), per dozen	...
Watermelons (small), per dozen	...
SOUTHERN FRUIT MARKET.	
Bananas, Fiji, per case	13s. to 13s. 6d.
" " per bunch	4s. to 7s. 6d.
" Queensland, per case	12s. 6d. to 13s.
" " per bunch	2s. 6d. to 5s. 6d.
Cocoanuts, per bag	10s. 6d. to 11s.
" per dozen	1s. 6d. to 2s. 6d.
Lemons (choice coloured), per case	12s.
" (good), per gin case	7s. to 8s.
" (rough), per gin case	4s. to 5s.
" (Italian), per case	13s. to 17s.
Mangoes, Queensland, per case	...
Oranges, American Navel, per case	16s. to 18s.
Oranges, common, choice, per case	10s.
Oranges, medium, per case	6s.
Passion Fruit, per quarter-case	5s. 6d.
Peanuts, per quarter-case	...
Pineapples, Queensland (Queens), choice, per case	4s. to 5s.
Pineapples, Queensland (Queens), medium, per case	3s. to 3s. 6d.
Rockmelons, per double case	...
Tomatoes, per quarter-case	3s. to 3s. 6d.
Watermelons, Queensland, per dozen	...

The wharf labourers' strike, has, it is stated, disorganised the interstate fruit trade.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH.

Article.		MARCH. Prices.
Bacon, Pineapple	lb.	$9\frac{1}{2}$d.
Bran	ton	£6 5s. to £6 10s.
Butter, Factory	lb.	$10\frac{1}{2}$d.
Chaff, Mixed	ton	£3 to £5
Chaff, Oaten	„	£6 to £7
Chaff, Lucerne	„	£5 to £5 10s.
Chaff, Wheaten	„	£3 to £3 5s.
Cheese	lb.	$6\frac{1}{2}$d. to $10\frac{1}{2}$d.
Flour	ton	£10 15s.
Hay, Oaten	„	£7 5s. to £7 15s.
Hay, Lucerne	„	£3 to £4 5s.
Honey	lb.	$2\frac{3}{4}$d.
Maize	bush.	4s. 3d. to 4s. 6d.
Oats	„	3s. 8d. to 3s. 10d.
Pollard	ton	£8 5s. to £8 10s.
Potatoes	„	£5 to £6 10s.
Potatoes, Sweet	„	...
Pumpkins	„	...
Wheat, Milling	bush.	4s. 10d. to 5s.
Wheat, Chick	„	4s. 9d. to 4s. 10d.
Onions	ton	£6 to £6 15s.
Hams	lb.	11d. to 1s.
Eggs	doz.	10d. to 1s. 4d.
Fowls	pair	2s. 2d. to 3s. 3d.
Geese	„	5s. 4d. to 6s.
Ducks, English	„	3s. to 3s. 6d.
Ducks, Muscovy	„	3s. 7d. to 4s. 9d.
Turkeys (Hens)	„	6s. to 7s. 6d.
Turkeys (Gobblers)	„	8s. to 12s. 6d.

ENOGGERA SALEYARDS.

Animal.	FEBRUARY. Prices.
Bullocks	£8 12s. 6d. to £10 7s. 6d.
Cows	£6 12s. 6d. to £7 10s.
Merino Wethers (Shorn)	21s. 6d.
C.B. „ „	20s. 6d.
Merino Ewes „	15s.
C.B. „ „	20s. 9d.
Lambs	15s. 9d.
Pigs (Baconers)	38s.
„ (Porkers)	27s. 6d.

Orchard Notes for May.

By ALBERT H. BENSON, M.R.A.C.

THE SOUTHERN COAST DISTRICTS.

The advice that I have given respecting the handling and marketing of citrus fruits in the last two numbers of this Journal apply with equal force to this and the following months. Do not think that you can give the fruit too much care and attention; it is not possible, as the better they are handled, graded, and packed the better they will carry, and the better the price they will realise.

Continue to pay careful attention to specking, and fight the blue mould fungus everywhere. Don't let mouldy fruit lie about on the ground, hang on the trees, or be left in the packing-shed; but destroy it by burying. Keep a careful lookout for fruit fly, and sweat the fruit carefully before packing. If this is done, there will be little fear of the fruit going bad in transit, or being condemned on its arrival at Southern markets.

Where the orchard has not been already cleaned up, do so now, and get it in good order for winter. Surface working is all that is required—just sufficient to keep moisture in the soil, keep down weed growth and prevent the packing of the surface soil by trampling it down when gathering the fruit.

Keeping the orchard clean in this manner enables any fallen fruit to be easily seen and gathered and I need hardly state what I have mentioned many times before—that diseased fruit should on no account be allowed to lie about and rot on the ground, as this is one of the most frequent causes of the spreading of many fruit pests.

May is a good month to plant citrus trees, as, if the ground is in good order, they get established before the winter and are ready to make a vigorous growth in spring.

Don't plant the trees, however, till the land is ready, as nothing is gained thereby, but very frequently the trees are seriously injured, as they only make a poor start, become stunted in their growth, and are soon overtaken by trees planted later that are set out under more favourable conditions. The land must be thoroughly sweet and in a good state of tilth—that is to say, deeply worked and worked down fine. If this has been done, it will probably be moist enough for planting, but, should there have been a dry spell, then, when the hole has been dug and the tree set therein and the roots just covered with fine top soil, 4 to 8 gallons of water should be given to each tree, allowed to soak in, and then covered with dry soil to fill up the hole. In sound free sandy loams that are naturally sweet, holes may be dug and the trees planted before the whole of the ground is brought into a state of perfect tilth. It is, however, better to do the work prior to planting, as it can then be done in the most thorough manner, but if this is not found possible then the sooner it is done after planting the better. If the land has been thoroughly prepared, there is no necessity to dig big holes, and in no case should the holes be dug deeper than the surrounding ground either is or is to be worked. The hole need only be big enough to allow the roots to be well spread out, and deep enough to set the tree at the same depth at which it stood when in the nursery. Plant worked trees 24 to 25 feet apart each way, and seedlings at least 30 feet apart each way.

Towards the end of the month cover pineapples where there is any danger of frost; dry blady grass or bush hay is the best covering. Keep the pines clean and well worked—first, to retain moisture; and, secondly, to prevent injury from frost—as a patch of weedy pines will get badly frosted when a clean patch alongside will escape without any serious injury.

Slowly acting manures, such as meatworks manure when coarse, boiling-down refuse, farm manure, or composts, may be applied during the month, as they will become slowly available for the trees' use when the spring growth takes place; but quickly acting manures should not be applied now.

Tropical Coast Districts.

May is a somewhat slack month for fruit—pines, papaws, and granadillas are not in full fruit, the autumn crop of citrus fruit is over, and the spring crop only half-grown. Watch the young citrus fruit for Maori, and when it makes its appearance spray with the sulphide of soda wash. Keep the orchards clean, as from now till the early summer there will not be much rain, and if the orchard is allowed to run wild—viz., unworked and dirty—it is very apt to dry out, and both the trees and fruit will suffer in consequence.

Bananas should be kept well worked for this reason, and, though the fly should be slackening off, every care must still be taken to prevent any infested fruit being sent to the Southern markets.

Citrus fruits can be planted during the month, the remarks *re* this, under the heading of the Southern Coast Districts, being equally applicable here.

Southern and Central Tablelands.

Get land ready for the planting of new deciduous orchards, as, although there is no necessity to plant so early, it is always well to have the land in order so as to be ready to plant at any time that the weather is suitable. The pruning of deciduous trees can commence towards the end of the month in the Stanthorpe district, and be continued during June and July. It is too early for pruning elsewhere, and too early for grapes, as a general rule. Keep the orchard clean, particularly in the drier parts. In the Stanthorpe district, I recommend the growing of a crop of blue or grey field peas or a crop of vetches between the trees in the older orchards as a green manure. The crop to be grown as a green manure should have the soil well prepared before planting, and should be manured with not less than 4 cwt. of phosphatic manure, such as Thomas' phosphate, or fine bone dust per acre. The crop to be ploughed in when in the flowering stage. The granitic soils are naturally deficient in organic matter and nitrogen as well as phosphoric acid, and this ploughing in of a green crop that has been manured with a phosphatic manure will have a marked effect on the soil.

Lemons will be ready for gathering in the Roma, Barcaldine, and other districts. They should be cut from the trees, sweated, and cured down, when they will keep for months, and be equal in quality to the imported Italian or Californian fruit. If allowed to remain on the trees, the fruit becomes over large and coarse, and is only of value for peel. Only the finest fruit should be cured; the larger fruit, where the skin is thicker, is even better for peel, especially if the skin is bright and free from blemish. Scaly fruit, scabby, warty, or otherwise unsightly fruit, is not suitable for peel, and trees producing such require cleaning or working over with a better variety, possibly both.

The remarks *re* other citrus fruit and the work of the orchard generally, that I made when dealing with the Coast Districts, apply equally well here, especially as regards handling the crop and keeping down pests.

Farm and Garden Notes for May.

Field.—During this month the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now in this work. Potatoes should be hilled up. Cut tobacco. The last of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Growers are notified that cotton-ginning machinery has been installed by Messrs. Kitchen and Sons, in the Valley, Brisbane, so that a sure means of disposing of the crop is available (*see* Journal of 1st March, 1906). Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to the climate and to their particular district and soil. A few acres of artificial grass will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass in the West, as has been proved at Barcaldine, will carry ten or twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Hautbois, and Trollope's Victoria. The Aurie is the earliest and the Marguerite next. In some localities strawberry planting is finished in March, and the plants bear their first fruits in August. In others fruit may be gathered in July, and the picking does not end until January.

Kitchen Garden.—Onions which have been planted in seed beds may now be transplanted. The ground should have been thoroughly cleaned, pulverised, and rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these, as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus. Full instructions for the successful cultivation of this valuable vegetable will be found in the February issue of the Journal, 1906.

Flower Garden.—Transplanting and planting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, penstemons, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, snowflakes, freesias, ixias, iris, narcissus, &c. Tulips and hyacinths may be tried, but success in this climate is very doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Agriculture.

ROTATION OF FORAGE CROPS.

BY D. MACPHERSON, Manager, State Farm, Biggenden.

The following system of rotation of fodder crops will, I believe, be found to suit the conditions pertaining to dairying in the coastal districts of Queensland. It is a five-year rotation, and comprises the most useful of the fodder crops:—

Divide the area under cultivation into six equal portions. Sow No. 1 with cereals for hay; No. 2, with mangolds; No. 3, maize; No. 4, sorghum; No. 5, cowpea; No. 6, lucerne.

In after-plantings keep the following rotation:—

Cereals, mangolds, catch crops, maize, sorghum, cowpea. Catch crops may be panicum, Japanese millet, turnips, peas, rape, &c. In five years, or whenever the lucerne begins to go off, plough it out, and plant maize in that block, sowing lucerne in whichever block had mangolds growing the previous season.

Where practical, a large proportion of lucerne would be an advantage, as it would permit of its being brought into the rotation oftener.

With six equal plots, and allowing lucerne five years to the plot, it would be 30 years before every plot had grown lucerne; but, with twice the area, every block would receive the benefit of it once in 15 years, and the improvement in forest land, after carrying lucerne for a few years, has to be seen to be realised. Should equal areas of maize and sorghum not balance—*i.e.*, not give enough grain—Kafir corn could be grown for grain instead of so much sorghum.

Carrots and swedes could be used with or instead of mangolds. Cowpea following sorghum, besides providing a splendid hay, improves the soil, and kills out the self-set sorghum as no other crop will.

Mangolds, being one of the best crops to clean the ground, are particularly suitable to precede lucerne.

ILLUSTRATION OF ROTATION.

1st year Maize 2nd ,, Sorghum 3rd ,, Cowpeas 4th ,, Cereals 5th ,, Mangolds 6th ,, Lucerne	1st year Cereal 2nd ,, Mangolds and catch crop 3rd ,, Maize 4th ,, Sorghum 5th ,, Cowpea	Lucerne for, say, 5 years; then plough out and plant with Maize, following with other crops in rotation.
1st year Sorghum 2nd ,, Cowpea 3rd ,, Cereals 4th ,, Mangolds and catch crops 5th ,, Maize	1st year Cowpea 2nd ,, Cereal 3rd ,, Mangold (catch crop) 4th ,, Maize 5th ,, Sorghum	1st year Mangolds and catch crop 2nd ,, Maize 3rd ,, Sorghum 4th ,, Cowpea 5th ,, Cereal.

HOW TO SUCCEED IN LAMB-RAISING.

Buy old sheep, good full-mouthed ewes, and take a couple of seasons out of them; then get them as fat as you can, and sell them. Don't mind paying a good round price for a ram, and don't make the mistake of letting him run all the year round with the ewes. Either pen him up and hand-feed him, or get someone with a flock of rams to paddock him. Put him to the ewes early in December, and take him out in April. It will pay any man who cultivates 100 acres, and has 100 fallows, to keep sheep. If he cannot keep more, 30 ewes and

a ram will generally return 28 lambs—often far more. These lambs will fetch from 8s. to 12s. and ewes 15s. each. The wool off the ewes is another item, and would yield about 4s. per sheep, or say 12s. for wool and lamb per ewe. On 30 ewes that is £18. The sheep will also keep the weeds down, and supply a good deal of valuable manure. Lamb-breeding can be nothing but profitable, and every farmer should try it.

WHEAT-GROWING IN DRY AREAS.

It is well known that our best wheat-growing soils are situated within the area of precarious rainfall, and if it be possible to bring the enormous territory we possess on the fringe of the reliable rainfall area into reasonably satisfactory wheat production, the potentialities of our production would be increased to a fabulous extent. The question of wheat production on arid areas in America has been given a useful reply by the discoverer of the Campbell system of soil management. The system was extensively written up in our agricultural Press, but our farmers have taken little notice of the matter. Renewed attention will now be given to it in view of the excellent results following its adoption in South Australia. The Hon. T. Pascoe, M.L.C., read an instructive paper recently at the Whyte Yarcowie Agricultural Bureau on the Campbell system, and his results must compel careful consideration by our growers on the outer edge of the agricultural area. Mr. Pascoe describes the results of experiments conducted by Mr. Pearce, the secretary of the society, and himself. The former treated part of his 1906 fallow on the lines of the Campbell system so far as was possible with the implements at his command. The sub-packer which is used in America had to be dispensed with. The Campbell system gave a crop of 9 bags, or 38 bushels per acre, while the ordinary methods with other conditions parallel yielded only 5 bags, or 21 bushels, giving a balance of 17 bushels in favour of the Campbell system. Mr. Pearce's experiments were conducted within the limits of comparatively sure rainfall, and show that the Campbell system will largely increase the yield in such areas. The results obtained by Mr. Pascoe are conveyed in the following crop and rainfall records since 1903:—

	1903. In.	1904. In.	1905. In.	1906. In.	1907. In.
January ...	26	84	1.12	4	8
February ...	86	2.10	17	62	4
March	87	67	...	2.14	15
April	1.91	26	1.14	...	1.72
May	1.11	1.00	1.96	96	85
June	1.07	86	1.10	2.90	2.98
July	61	1.34	1.82	97	1.46
August	1.15	81	43	87	95
September ...	2.46	37	93	1.67	49
October ...	80	2.06	1.54	1.09	66
November ...	4.37	15	...	2.26	1.42
December ...	36	10	...	95	66
Totals ...	15.83	10.56	10.21	14.47	11.46

Averages per acre:—1903, 10 bushels; 1904, not seed; 1905, 3 bushels; 1906, 5 bushels; 1907, nearly 13 bushels.

It will be seen that the rainfall in 1907 was the second lowest since 1903, it being only an inch more than the lowest, which, in 1904, was not sufficient

to produce seed. Yet the Campbell system, though only imperfectly carried out, enabled the land to produce nearly 13 bushels per acre, which is 3 bushels better than was produced in 1903, with a rainfall of close upon 16 inches. Last year (1906) 14½ inches of rain yielded only 5 bushels, and Mr. Pascoe is confident if he had not introduced this system of soil treatment this year's crop would not have exceeded 5 bushels. Mr. Pascoe stated that "the two critical months were not favourable. From the middle of August to the last day of October we had very little rain, the greatest fall in one day being 0.41 on 23rd September, the total during that period being under an inch. We had more hot winds than usual this spring, but as a set-off against the hot winds we had less frosts. In my previous papers I pointed out that it is not always the quantity of rain that falls, but the time when it falls that is vital; and so often, when we have had failures, they have been because just at the critical time when it was needed rain did not come, the wheat went back, and I said, 'If this system will help us over these dry spells, so that the wheat will be able to get the full advantage of the rain when it comes, it will be a good thing.' Now, that is just what it did for me this year, and my wheat never went back." It has been argued by many of our farmers that the Campbell system is not new, and that its programme is that which most of our farmers adopt, but the system is merely the proper carrying out of cultural operations which are improperly carried out under ordinary methods. The system is not revolutionary, but evolutionary. The main points of Professor Campbell's methods are—first, the thorough pulverisation of the top few inches of the fallow previous to ploughing; secondly, the sub-packing of the soil after fallowing. This may be regarded as the central idea of the system. The object is to secure a compact but not solid subsoil, in which moisture may not only be effectively stored, but may also move freely under capillary attraction. Open spaces in soil, or an overloose condition, are fatal to the effective movement of subsurface moisture or its proper retention. It is in order to ensure that that Professor Campbell invented the implement termed the subpacker, which consolidates the subsoil without compressing the surface soil. The next important part of the system is the cultivation of the fallows after rains, with the object of locking in the soil all the moisture that can be stored up for the forthcoming crop. It is unnecessary here to describe the principles upon which this is based. The rest of the system is the application of the same cultivation to the growing crops as long as circumstances permit. It will thus be seen that the whole process is woven around the object of securing the maximum amount of moisture in the soil.

The conclusions Mr. Pascoe has arrived at from his experiments and observations are:—"The conclusion I have come to is this: That while my crop was not a sensational one, it was a long way ahead of anything I could have got by the ordinary system under similar conditions, and I am confident that if the Campbell system be given a fair trial it means bigger yields, better sample, failures reduced by 60 per cent., and comfort taking the place of penury. I believe we are on the eve of a great revolution in the system of farming in these areas. The application of brains to agriculture has done wonders, both for the social status and the pockets of the farmers, inside the rainfall line in recent years, and I see no reason why we should not adapt our methods to our conditions outside, and so reap fair crops in years that would, under present conditions, produce failures, and big crops in years that now produce fair ones." Here is a field of investigation that should fittingly come within the scope of State farm work. The Department of Agriculture might import or have built a Campbell soil-packer, and on portion of the fallows at Narrogin, Chapman, and Nangeenan give a demonstration of the Campbell system of soil management. There is abundant evidence to show that its adoption has made possible and profitable wheat-growing in hitherto unfavourable districts of America, and whatever will increase our wheat yield or widen the area of its profitable production will be a consummation of great national importance.—"Morning Herald" (from the "Journal of Agriculture of Western Australia").

THE SIZE OF CORNSACKS.

The action of the Federal Government in attempting to regulate the size of cornsacks has excited (says the "Journal of Agriculture of Western Australia") widespread opposition amongst farmers in the Horsham and Wimmera districts of Victoria, says the "Australasian," and the local agricultural society has formulated a statement of the case from the farmer's point of view. The following are interesting extracts from the report submitted:—

Statement of cost.

"First.—1,000 standard sacks of 240 lb. are equal to 1,200 reduced sacks of 200 lb., therefore 200 more sacks will be required. It has not been suggested that the price of the reduced sack will be lower than the standard sack, and we know in practice that small reduction in size or quality is never followed by reduction in price. First loss, therefore, is 200 sacks at regular rate of rather over than under 7s. per dozen.

"Second.—The harvester is now in almost general operation, and in practice every sack undergoes a preliminary 'jumping' and filling from the harvester. Second loss—this operation 200 times repeated at 3d. per dozen.

"Third.—The bags, first filled from the harvester and left in small heaps through the paddock at convenient intervals, are then taken and 'jumped,' and filled to the limit, the contents of one or more firstly filled bags being used for the purpose, and then sewn. A hank of twine at 6d. will sew from 55 to 60 bags. The ruling rate in the harvest fields for this process of filling and sewing is 1d. per bag. There will not be a proportionate reduction because of the reduced size. The rate is too much of a standard now. Third loss—cost of time, 1s. 8d.; cost of filling and sewing 200 bags at 1d., 16s. 8d.

"Fourth.—Loading on farm. Loading 200 bags under the conditions obtaining of moving from heap to heap is fair work for two men, and one horse at bag loader, for four days. Fourth loss—loading, 10s.

"Fifth.—Stacking at railway on platform or in grain-shed. The ruling rate is 1d. per bag in and 1d. per bag out. It is not suggested that lumpers' wages shall be reduced in proportion to the bag! Fifth loss—stacking and trucking 200 bags at 2d., £1 13s. 4d.

"Sixth.—Carting: The ruling rate for carting is 1d. per bag per mile. Higher for short distances over 10 to 12 miles. The system of charging at per bag is firmly fixed. No change took place when the second-hand bag and the Java bag cropped up. The same rate applies to oats as to wheat, though in the standard sack oats run to only 170 to 180 lb., as against 240 to 260 lb. of wheat. A great proportion of the carting is done by contract, and the value and cost of the work are now too well fixed to hope for change. Taking 10 miles as the average carting distance at 1d. per bag per mile—and keeping in mind that under 5 miles the rate would be higher, this seems reasonable—the result would be: Sixth loss, carting at average rates, 200 bags at 10d., £8 6s. 8d.

Totals.

	£	s.	d.
First, cost of extra bags, 200 at 7s. per dozen	5	16	8
Second, cost of filling and 'jumping' from the harvester, 200 bags at 3d. per dozen	0	4	2
Third, cost of twine, 200 bags at 6d. per 5 dozen, 1s. 8d.; filling and sewing, 200 bags at 1d., 16s. 8d. ...	0	18	4
Fourth, cost of loading 200 bags	0	10	0
Fifth, cost of stacking, in and out, 200 bags at 2d. ...	1	13	4
Sixth, cost of carting, 200 at 10d. per bag	8	6	8
Total	£17	9	2

"Taking, then, the case from the humanitarian point of view—

First—Is the standard sack too heavy?

Second—Is the way to meet the difficulty—

(a) To force the farmers to use a smaller sack; or

(b) To force the shipper or stevedore to provide mechanical appliances for stowing the sacks in the ships' holds?

"It is no part of the farmers' case to show that the standard sack is not too heavy until it shall, first of all, have been shown that there is no other way of stowing the sacks in the holds than by the employment of men as beasts of burden. Far heavier commodities than standard sacks are stowed in holds. The farmer, at his end, has been enterprising enough to get hold of the bag-loader; the lumper at the railway station has the horse-whip. Why should the stevedore—a speculator in human labour, if ever there was one—be not taken in hand, and made to use up-to-date means? Why should retrograde methods by him be encouraged at the cost of the farmer? If the farmer is to be encouraged, then economy in production must be encouraged, not opposed. If by making up his product in 1,000-lb. parcels he can economise, then 1,000-lb. parcels it should be. The problem of handling the parcel should be faced and overcome.

"To meet the humanitarian side of the case, while present conditions of loading in the ships' holds necessarily continue, the farmers are prepared to advocate the restriction in size of the wheat sack to the old standard sack of the '44 by 26½, 8 porter and 9 shot.' This size has been well within the strength of the men for the past forty years, but the time has come when the cost of loading the ships must be reduced, not increased. The farmers consider that the energies of the Executive should be directed towards developing cheaper methods of loading vessels. Let the Executive insist on the adoption of modern appliances, rather than, by retrograde step of the kind contemplated, fix on the back of labour for years to come the load of even the 200-lb. sack. The so-called 'unenterprising' and 'slow-going' farmer has taken the bags from the shoulders of himself and his children, by using bag-loaders on the farm; let the Government and the unions do the same for the men."

SCIENCE IN AGRICULTURE.

From time to time someone denies the value of science in agriculture, but the time has since long passed into oblivion when it was necessary to repel the assaults on scientific agriculture. While occasionally a man entirely ignorant of science may be a good farmer, no one can attain the highest success unless he understands the principles which underlie agriculture. He must know something of soils and fertilisers, plant and animal growth, nitrogen's place in agriculture, the nature of and changes which take place in milk, butter, cheese, &c. During the last twenty-five years it has been demonstrated over and over again that a thorough understanding of these general principles and their practical application are great factors in successful farming. We have an institution in Queensland—the Gatton Agricultural College—where these principles are thoroughly taught, and the record of the College shows that those students who went through the three-years' course of practical scientific agriculture, dairying, pig-breeding, &c., are to-day amongst the most successful farmers in the State.

On this subject a writer in a New South Wales exchange says:—

Notwithstanding all that has been said and written about the value of science in agriculture, there are still many people who altogether ignore it. At the last Royal Show, in the section devoted to Government exhibits, an

expert was imparting some scientific information to a number of country visitors. One of them contended that science was not essential to agriculture, and in support of this mentioned that the most successful farmer in a certain district did not know how to read or write. There is always an exception to prove the rule, and occasionally a man totally ignorant of science may be a successful farmer. There is no getting away from the fact, however, that present-day conditions render a knowledge of the principles that underlie agriculture essential to successful farming. During the past quarter of a century this has been demonstrated over and over again. The farmer who cultivates must know something about soils and fertilisers, plant and animal growths, &c. The dairyman must understand the nature and changes which take place in milk, butter, cheese; and the orchardist, in the same way, needs to be posted in the scientific side of the business. A thorough knowledge of these principles and their practical application are great factors in successful farming.

REINFORCED CONCRETE SILO.

This silo is designed to be constructed almost entirely of steel, barbed wire, and cement concrete. The standards or uprights are of 2 inches by 2 inches T section steel bars, tied horizontally with flat bars, locked to the uprights, and with barbed wire, secured to the uprights by strong wire ties. The concrete should be of coarse sand and cement in the proportion of 3 of sand to 1 of cement, and should be run into moulds in position. It is estimated that the rate of progress in construction would be 3 feet per day, so that nine or ten days should suffice to fill in the concrete when the framework is in position. The whole of the roof may be removed in sections quite easily, and replaced without trouble, thus enabling the structure to be completely filled before putting on the roof. When the concrete is once set, the silo is indestructible, neither fire, weather, nor insects being able to make any impression on it. In districts where coarse sand is easily obtained it can be erected quite as cheaply as if of wood. On many farms a suitable position can be found on a slope of ground convenient to the homestead on which the silo could be erected, loaded from a wagon at the top, and emptied on the lower side, the concrete making this quite possible, when with timber it would be impossible.

BOUNTIES ON AUSTRALIAN PRODUCTS.

COMMONWEALTH OF AUSTRALIA.

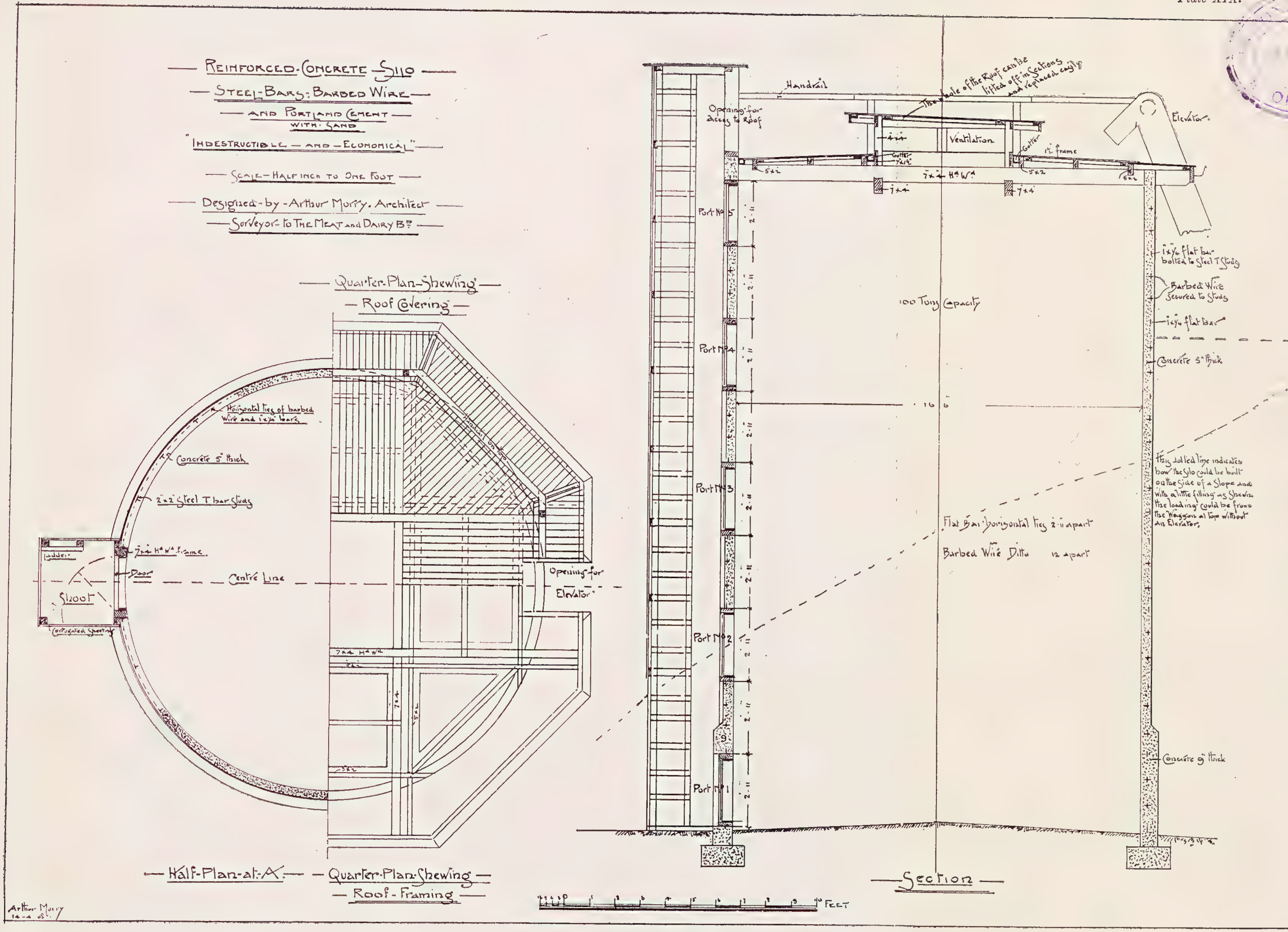
NOTE.—The forms of "Notice of Intention to claim Bounty," and all other forms required by the Regulations, also copies of the Regulations and all information on the subject, may be obtained on application at any Customs Office.

MEMORANDUM FOR THE INFORMATION OF GROWERS AND PRODUCERS.

The Bounties Act, 1907, which is now in force, provides for the payment of a total sum of £339,000 (spread over a term of years) as bounty for the production in Australia of certain specified articles.

The First Schedule to the Act, here reproduced, shows the goods upon which bounty is payable, the number of years during which payments will be made, and the rates of bounty, &c.

Plate XIX.



RE-INFORCED CONCRETE SILO.

First Schedule.

First Column. — Goods on Production of which Bounties are Granted.	Second Column. — Period dating from 1st July, 1907, during or in respect of which Bounty may be Paid.	Third Column. — Rates of Bounty.	Fourth Column. — Maximum Amounts which may be Paid in any One Year.
			£
Cotton, Ginned	8 years ...	10 per cent. on market value	6,000
Fibres—			
N.Z. Flax	10 years ...	10 per cent. on market value	3,000
Flax and Hemp	5 years ...	10 per cent. on market value	8,000
Jute	5 years ...	20 per cent. on market value	9,000
Sisal Hemp	10 years ...	10 per cent. on market value	3,000
Oil Materials supplied to an oil factory for the manufacture of oil—			
Cotton seed	8 years ...	10 per cent. on market value	1,000
Linseed (Flax Seed)	5 years ...	10 per cent. on market value	5,000
Rice, Uncleaned	5 years ...	20s. per ton ...	1,000
Rubber	15 years ...	10 per cent. on market value	2,000
Coffee, Raw, as prescribed	8 years ...	1d. per lb. ..	1,500
Tobacco Leaf for the manufacture of cigars, high grade, of a quality to be prescribed	5 years ...	2d. per lb. ...	4,000
Fish—			
Preserved as prescribed	5 years ...	½d. per lb. ...	10,000
Fruits—			
Dates (dried)	15 years ...	1d. per lb. ...	1,000
Dried (except currants and raisins) or Candied, and exported	5 years ...	10 per cent. on market value	6,000
Combed wool or tops, exported	3 years, commencing from 1st January, 1909	1½d. per lb. ...	10,000
	1 year, commencing from 1st January, 1912	1d. per lb. ...	
	1 year, commencing from 1st January 1913	1d. per lb. ...	

White Labour.

An imperative requirement of the Act is that white labour only shall be employed in the production of the goods upon which bounty is to be claimed.

The only exceptions to the requirements as to white labour are that the employment of any

> Aboriginal native, or of any coloured person born in Australia and having one white parent,

is not deemed a bar to the payment of bounty.

A coloured person who is the owner, occupier, or lessee of any land or factory in which the goods were grown or produced, or in which the goods have undergone any process, is deemed to be employed in the production of the goods, and if not exempt on account of birth in Australia, and having one white parent, his connection with the goods will prejudice the claim for bounty, unless the Minister otherwise directs.

This provision has the effect of preventing a person whose employment in the service of another would cause the claim for bounty to be rejected, from obtaining bounty as an employer of white labour.

STANDARD WAGES.

The wages paid in the production of the bountiable articles must be the standard wages payable in the place or district. This does not apply to members of the family of a grower or producer.

NOTICE OF INTENTION TO CLAIM BOUNTY.

Any person producing, or intending to produce, any of the goods enumerated in the above Schedule, and desiring to obtain bounty, should fill in a "Notice of Intention to claim Bounty," and forward to the State Collector of Customs, or to the officer in charge of the nearest Customs office.

With regard to any soil products, Notice of Intention to claim Bounty should be sent to the Collector of Customs not later than sixty days after planting. In the event of the crops having been planted before the commencement of the Act, the Notice of Intention to claim should be sent to the collector before the 10th June, 1908.

As to manufactures, Notice of Intention to claim Bounty should be sent to the Collector of Customs at least ninety days before bounty is claimed, but if so requested the manufacturer's notice will be accepted as a continuing notice.

As to any bountiable goods manufactured after 1st July, 1907, and before the commencement of the Regulations, the Minister may authorise payment of bounty if he is satisfied that the requirements of the Act have been complied with, that is, particularly, that white labour has been employed and standard wages paid.

MINIMUM QUANTITIES.

In order to obtain bounty, the grower or producer must have produced not less than the quantities specified in the subjoined table within one financial year—that is, between the 1st July in any one year and the 30th June in the next succeeding year:—

Goods.	Minimum Quantity.
Cotton, Ginned	250 lb.
Fibres—	
New Zealand Flax	5 tons
Flax and Hemp	5 cwt.
Jute	10 cwt.
Sisal Hemp	1 ton
Oil Materials—	
Cotton Seed	5 cwt.
Linseed	5 cwt.
Rice, Uncleaned	1 ton
Rubber	2 cwt.
Coffee, Raw	250 lb. of coffee beans
Tobacco Leaf	5 cwt.
Fish, Preserved	5 tons
Dates	10 cwt.
Dried Fruits	5 cwt.
Combed Wool Tops	1 ton

QUALITY.

The Act provides that in every case the goods produced must be of merchantable quality, and, with regard to certain foodstuffs—namely,

Coffee, raw,
Dates,
Fish, preserved,
Fruits, dried or candied,
Rice, uncleaned—

the Regulations require that in every case the goods shall be sound and of good marketable quality. The quality prescribed with regard to tobacco leaf is determined by its selling value. No bounty will be paid upon tobacco leaf unless there is satisfactory proof of sales to a *bonâ fide* purchaser at a price of not less than 1s. per lb., or on proof that the leaf is equal in quality to that which is usually sold at 1s. per lb.

PARCHMENT COFFEE.

If coffee, upon which bounty is claimed, has been delivered at a factory in the form of parchment coffee, evidence must be supplied as to the weight of coffee beans obtainable or obtained from the particular delivery.

DELIVERY AT FACTORY, SALE, OR EXPORT.

The goods upon which bounty is claimed other than those which are essentially factory products must be delivered to a factory which, unless the Minister otherwise approves, should be within the State, or may be dealt with by way of *bonâ fide* sale otherwise than for delivery to a factory or, except in the case of cotton seed or linseed, may be exported. The Act requires that cotton seed and linseed upon which bounty is claimed shall be supplied to an oil factory for the manufacture of oil. The premises of a grower may be considered a factory if they are furnished with the necessary appliances for treating any of the products in the schedule above.

SPECIAL PROVISIONS AS TO MANUFACTURES.

For the purpose of convenience, three items—namely,

Fish, preserved,
Fruits, dried or candied (except currants and raisins),
Combed wool or tops—

are spoken of as manufactures. As to two of these—namely, dried or candied fruits and combed wool or tops—the bounty is not payable unless the goods have been exported, and with regard to all three the bounty is payable to the manufacturer and not to the primary producer.

Dried or candied fruits, upon which bounty is claimed, must be packed in a manner approved by an officer of Customs, and the packages when tendered for shipment must bear such trade description as is required by the Regulations of the Commerce Act.

DIRECTIONS AS TO GOODS EXPORTED.

Persons intending to claim bounty upon those items as to which export is necessary and as to any other bountiable goods which it is desired to export before bounty has been paid must—

(*a*) At least one week before shipment give notice to the collector at the port of export of intention to export such goods.

(*b*) Comply to such an extent as may be required by the collector with the provisions of the Customs regulations relating to drawbacks in respect of—

  (1) Notice of intention to pack;
  (2) Packing;
  (3) Entry for drawback;
  (4) Payment for officers' services.

(*c*) Furnish to collector or to any authorised officer, on demand, and without charge, fair samples of the goods to be exported.

(*d*) On demand furnish free of charge, to any officer of Customs, samples of the bulk of the goods when tendered for shipment.

(*e*) Furnish to the collector a statutory declaration that the goods exported or to be exported are wholly of Australian origin.

ACCOUNT SALES.

In case of bounty payable only upon exportation of goods, the Minister may, before payment of bounty, require the production of account sales of the exported goods, and satisfactory verification of those account sales.

SPECIAL PROVISIONS AS TO FISH, PRESERVED.

The term "Fish, preserved," is deemed to include fish put up in tins, smoked fish, salted fish, and dried fish. The fish must have been caught in Commonwealth inland waters or seas surrounding Commonwealth shores, and, in the case of sea fishing, from boats owned in the Commonwealth.

CLAIM FOR BOUNTY.—TIME WITHIN WHICH TO BE MADE, &C.

The claim for bounty must be made in duplicate and forwarded to the State Collector of Customs or to the officer in charge at the nearest Customs house within thirty days after the date of—

Delivery to factory, or

Sale within the Commonwealth, otherwise than for delivery to factory, or

Export.

With regard to manufactures, in the case of goods upon which bounty is payable only on exportation, the claim for bounty must be made within thirty days after exportation.

As to fish, preserved, claim should be made within thirty days of completion of manufacture, or at regular intervals that may be arranged with the State collector.

As the Act fixes a maximum amount which may be paid as bounty in any financial year on any particular product, it is necessary for the department to know, at as early a date as possible, the whole amount of the claims for that year, and the Regulations accordingly provide that claims for bounty on natural products should be lodged before the 1st April in any year and on manufactures before the 1st May.

Any claims lodged after those dates in any financial year will, unless the Minister otherwise directs, be considered in relation to the funds available for the payment of bounty in the next financial year. (See also next paragraph.)

PROPORTION OF BOUNTY PAYABLE IF AMOUNT AVAILABLE NOT SUFFICIENT TO PAY THE WHOLE.

If the recognised claims for bounty in any one financial year exceed the amount fixed by the Act as payable during that year in respect of any one item the amount available will be distributed proportionately. The Act provides that if the maximum amount payable on any item has not been wholly expended during a particular year, it will be available for distribution in any subsequent year of the period during which bounty may be paid, as an addition to the maximum for that year.

PURCHASER'S CERTIFICATE.

Where a grower claims bounty upon goods which have been sold to a manufacturer or otherwise, he should obtain from the purchaser a certificate showing the quantity purchased and the price paid.

PROOF AS TO VALUE.

The bounty is in many cases a percentage of, or dependent upon, the market value of the goods, and in all such cases the Collector of Customs is at liberty to require any reasonable proof to be furnished as to the value put upon the goods by the claimants for bounty.

Department of Trade and Customs,

Melbourne, 16th March, 1908.

A CHEAP SILO.

The accompanying illustration of an effective and very cheap silo has been forwarded to us by Mr. Arthur Jones, of Bondoola, near Rockhampton. The drawing was so carefully compiled by an officer of this Department that there appears to be no necessity for printing the whole of the specification accompanying the rough sketch. The illustration speaks for itself.

Mr. Jones writes:—

In the "Queensland Agricultural Journal" several types of silos have been described, but all are costly and beyond the reach of struggling selectors unless they are so fortunate as to be near a sawmill. To help such, I have thought out a type of silo that can be erected by any bush carpenter or any man who can erect a good two-rail fence. The material for it can be obtained on most selections; timber that will split into only 4-inch wide billets will do, provided they are straight. I am sending you a ground plan and part of the side elevation (to show the posthole and how it is constructed) of a square silo to hold 96 tons of silage. (An octagon or polygon would hold more in proportion to the side area, but would be more difficult to make.) The material for the silo under consideration consists of 500 6-inch slabs, 6 feet long. Where wider slabs can be got, a less number will do. Four posts, 30 feet long, with not less than 5 inches of redwood at the top; 5 feet of the bottom of each must have all the sapwood removed—this is the depth to which they are sunk into the ground. Also 20 poles for beams, 19 feet long, with not less than 5 inches redwood at the small end; the posts and also the beams must be of a variety of timber that will bear a good strain. The slabs are dressed for the first 6 inches on the sap side to a straight line of sufficient depth to cut out the sap at the edges, also without wind. The inside is then dressed to a straight line from end to end, and 2 inches thick at each end (do not touch the edges, the more splinter and the rougher they are the better). The slabs should be split and dressed six months before they are used, that they may have time to shrink. Forty 6-inch spikes, $\frac{3}{8}$-inch or $\frac{1}{2}$-inch in thickness, and a quantity of 4-inch stout nails (No. 6) for nailing on the slabs. One hundred and twelve of the slabs should be 6 feet 6 inches long; these are for the two opposite sides of the lower set of slabs, also to finish up even at the top. The 20 beams should be squared to 4 inches at each end for 2 feet from each end, and one face taken right through for the slabs (which are vertical) to rest against. Mark out the holes for the posts. If a peg is first driven in the centre and a circle of 21 feet 6 inches described, this circle will be the exact inside of the posts where they are dressed for the beams to fit against—that is, the posts will be 21 feet 6 inches apart across the angles, and 15 feet apart along the sides. The holes should be sunk 5 feet deep if the insides of the holes are sunk perpendicularly (take care before putting in the posts to see that this face is true perpendicular), and the outer end sunk in steps, and all the earth taken out must be placed a little further out, as high as it can be heaped. By doing this, if the posts are rolled up a plank or slab on to the top of these heaps, much labour is saved in the lifting. Two chalk lines struck along the inner wall lines (at right angles) are struck on each post before they are put up; also a small nail should be driven into them at intervals from top to ground line. This is to pick it up if rain or something else should obliterate the line. A straightedge placed against these nails will, with a plumb rule, enable such post to be placed perfectly true. After the posts are up, all earth that could not be rammed into the holes should be shovelled into the centre of the silo space to raise the floor, and more must be added to raise the inside an inch or two. Two of the beams are spiked on, one at the opposite side to the other, at exactly the same level, also same level at both ends, taking care to keep the faced sides inwards. The post will need to be dressed or notched-in to allow of this being done. (I think it preferable to do this as the work proceeds, for if the posts are faced on the ground they spring too much; if wire

was stretched across from post to post at the top, it would prevent them spreading at the top.) Two more beams are now spiked on to the opposite spaces, completing the square, and keeping the faced sides inwards. A complete square is now spiked to match the two length of slabs, the two opposite sets being 4 inches higher than the other two; this makes a strong corner. After this, each side set will be exactly 6 feet from centre to centre for exactly 6 feet slabs, and the slabs must be cut to that length exactly. At the top two different lengths are needed to level up when all the beams are up, and care should be taken to keep all the posts the same distance apart each way; if too wide, to spring them in before spiking the beams on. The slabs are nailed on with the sap side outwards, and placed so that the heart or red wood touch at the outer edge; should sapwood interfere, it should be dressed off on the outer side. As the slabs will vary in width at each end, they will have to be reversed to keep the leading side plumb. Select one side of a square for the post holes—a side most convenient for feeding—taking care not to put them on a side you are likely to need in extending the silo at some future time.

It will be noted that at the edges of the slabs are V-shaped spaces. These I propose to fill either with bricklayers' mortar or pug them up with surface soil containing 2 parts of sand to 1 of clay. Any soil which will not crack in drying is suitable. If all the splinters are left on the edges of the slabs, the mortar will remain in the spaces for years. Such a silo can be built for a few pounds of actual outlay.

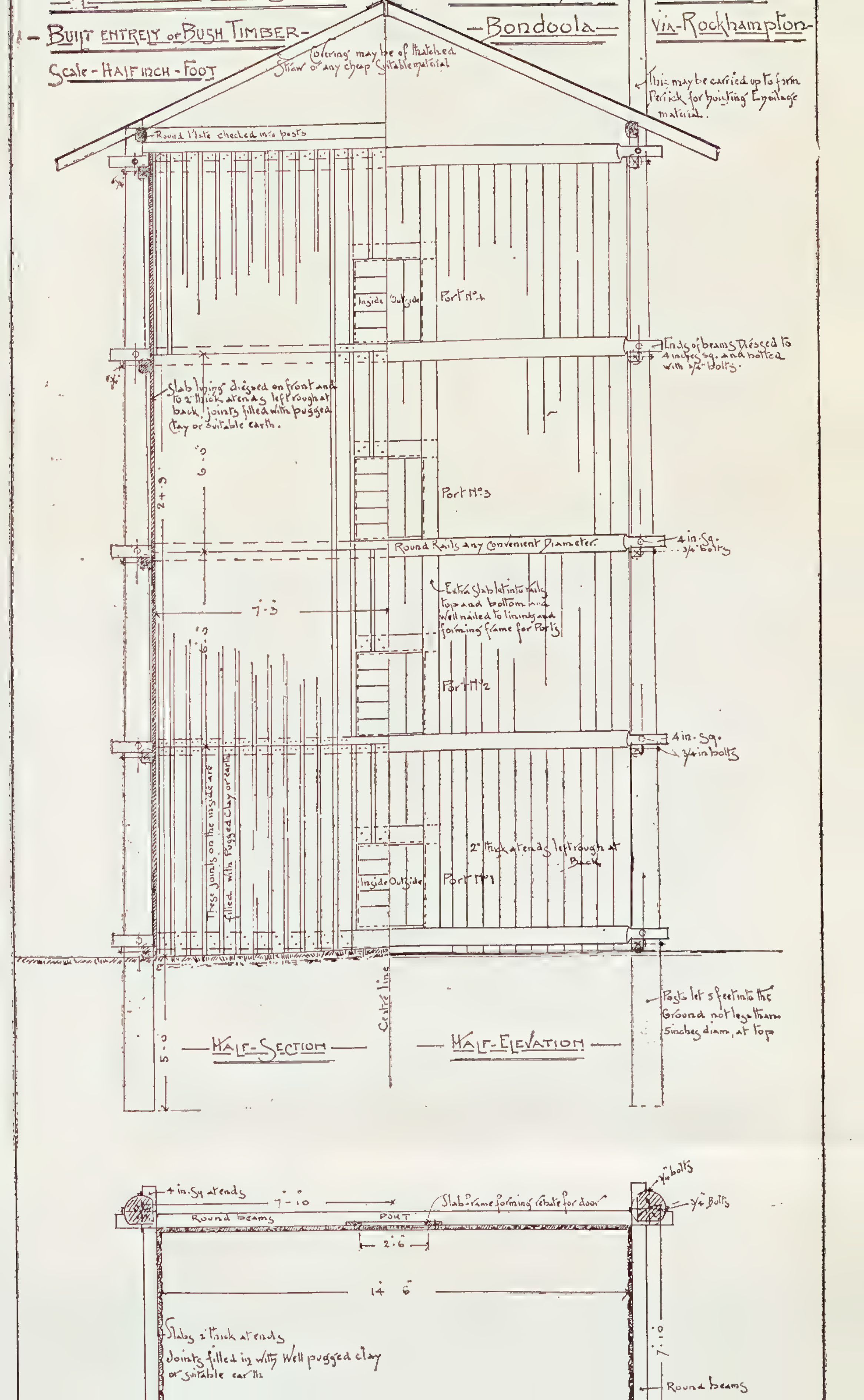
A silo of the above dimensions, capable of holding 100 tons, contains sufficient to feed 30 cows for a period of 180 days, giving to each cow silage at the rate of 40 lb. a day. It can be filled by the one crop of maize grown on 6 acres, sown thickly, say 6 inches apart, in rows spaced at a distance of 15 inches apart. The maize is not cut till the grain is fully glazed and nearly fit to pull. If cut at this stage the stalks are full of sugar; at an earlier stage the stalks sour; on the other hand, if cut later they become woody and useless. The above 6 acres should give a surplus of 20 tons to provide for a partial failure. In those parts of the State where two crops can be obtained from the same ground in one season, two of such silos could be filled from the above 6 acres.

Certainly this ought to be within the reach of most farmers, and, if provided, would certainly prevent, or greatly lessen, the heavy losses in cattle, also in cream and butter, during our constantly recurring droughts.

TICKS ON DOGS.

Valuable dogs are often killed owing to the attacks of scrub (not cattle) ticks. If the ticks are promptly removed, a dog will usually recover, but if they are not detected the animal rarely survives. In the case of woolly-haired dogs the insects are difficult to find, in which case the dog may be sheared and the ticks removed. They should not be forcibly pulled off, as the mandibles are invariably left in the animal's skin, and the mischief goes on. Insects breathe through their bodies, hence, if the pores are closed by the application of oil, turpentine, or kerosene, the tick dies, and may be extracted entirely. If the ticks cannot be found, the following dressing may be found of some service:—

Soft soap, 4 oz.; kerosene, 1 teacupful; water, 1 quart. Boil the soap and water together until the soap is dissolved. When cool, add the kerosene, and agitate the mixture thoroughly for five minutes with a rod. Wash the dog all over with some of this mixture. Give internally 3 to 10 gr. of iodide of potassium in two tablespoonfuls of water. The above recipe is recommended by Mr. G. Tucker, Veterinary Surgeon, Department of Agriculture and Stock.



- BUILT ENTRELY OF BUSH TIMBER -
- Bondoola -
VIA-Rockhampton-
Scale - HALF INCH - FOOT
Covering may be of thatched Straw or any cheap suitable material
This may be carried up to form Derrick for hoisting Ensilage material.
Round Plate checked into posts
Inside
Outside
Port No 4
Ends of beams Dressed to 4 inches sq. and bolted with 3/4 bolts.
Slab lining dressed on front and to 2" thick at ends left rough at back, joints filled with pugged clay or suitable earth.
Port No 3
Round Rails any Convenient Diameter.
4 in. Sq.
3/4 bolts
Extra slab let into rails top and bottom and well nailed to linings and forming frame for Ports
7·3
Port No 2
4 in. Sq.
3/4 in bolts
These joints on the inside are filled with Pugged Clay or earth
2" thick at ends left rough at Back
Inside
Outside
Port No 1
Centre line
Posts let 5 feet into the Ground not less than 5 inches diam, at top
HALF-SECTION
HALF-ELEVATION
5·0
4 in. Sq at ends
7-10
Slab frame forming rebate for door
3/4 bolts
3/4 Bolts
Round beams
PORT
2·6
14 6
Slabs 2" thick at ends
Joints filled in with well pugged clay or suitable earth
Round beams

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RETURNS FROM 1ST TO 31ST MARCH, 1908.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Babcock Test, Per cent. Butter Fat.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Glen ...	Shorthorn ..	10 Feb., 1908	814	4·7	42·84	
College Lass	Ayrshire	1 Sept., 1907	673	5·2	39·19	
Eve ...	Jersey	27 Aug. ,,	531	5·7	35·10	First calf
Comet ...	Holstein-Ayrshire	23 ,, ,,	507	5·5	31·23	
Graceful ...	Guernsey-Sh'rth'n	14 Jan., 1908	704	3·9	30·75	
Conceit ...	Ayrshire ...	28 Oct., 1907	607	4·4	29·91	
Beauty ...	,, ...	20 Dec. ,,	719	3·7	29·79	
Clare ...	Jersey	21 Aug. ,,	412	6·4	29·53	
Aunty ...	Ayrshire ...	2 Sept. ,,	529	4·7	27·74	
Honeycomb	S.C. Shorthorn...	23 Aug. ,,	683	3·6	27·54	
Ivy ...	Jersey	5 Feb., 1908	598	4·1	27·45	
Mona ...	Holstein-Sh'rth'rn	Oct., 1907	727	3·3	26·86	
Laura ...	Ayrshire ...	20 May ,,	646	3·7	26·77	
No. 112 ...	Grade Jersey ...	23 Aug. ,,	530	4·4	26·18	
Bee ...	Jersey	16 Jan., 1908	407	5·7	25·99	
Olga ...	Shorthorn ...	24 Feb. ,,	677	3·4	25·78	
Cocoa ...	Jersey	20 Nov., 1907	636	3·6	25·64	
Bliss ...	,, ...	17 Sep. ,,	486	4·7	25·58	
Dot ...	Shorthorn ...	Aug. ,,	584	3·9	25·51	
Careless ...	Jersey	20 Oct. ,,	612	3·7	25·36	
No. 1 ...	S.C. Shorthorn...	2 Dec. ,,	701	3·2	25·12	
Dora ...	Shorthorn ...	9 Sept. ,,	589	3·8	25·06	Slipped calf
No. 48 ...	Grade-Shorthorn	18 Jan., 1908	638	3·5	24·91	
Gem ...	Shorthorn ...	29 Aug., 1907	594	3·7	24·61	

The heavy rains, together with the continual source of annoyance from mosquitoes during the month, detracted from the milk yield very much.

CURES FOR SCOURS AND REDWATER.

Mr. John Macdonald, Stone's Corner, gives what he considers to be a certain cure for scours in calves. The remedy is:—¼-lb. of butter mixed with a tablespoonful of baking powder, and made into a soft paste. This is put down the calf's throat, and the cure is effected in two hours. He says that this is also a capital cure for hoven.

In the case of redwater, he states that he had a cow eight years old, which had been ill for three days, and was not expected to live. He bled her in the nose, and cut off two lower joints of the tail. He then gave her a full quart of castor-oil to which a spoonful of turps was added. Her temperature before this treatment was 108 degrees. He then let her out, the temperature having decreased to 107½ degrees. She was allowed to drink as much water as she liked. Next morning she was dosed with 1 pint of linseed oil, ½-oz. of saltpetre, and a piece of brown resin, about the size of walnut, pounded fine. He did no more for a day or two, and then gave her oatmeal gruel. In four days the cow was much better. She slipped her calf at five months. Since then she has been giving 15 quarts of milk a day. She took the bull six weeks after being treated as above, and is due to calve in about six weeks (May). Altogether she was ill for three weeks, when she began to pick up, and Mr. Macdonald considers her now worth £15. She is a Jersey-Shorthorn, eight years old, and during the whole period of her illness she never went dry, but was milked daily.

THE KICKING COW.

A common question asked all round the world is how to deal with a kicking cow. The proper reply to this inquiry (says "Dairy") is: Do not keep a kicking cow. At the same time, every dairyman knows that kicking, as applied to cows, is a relative term, for, in one sense, every cow is at some time in her life more or less handy with her hind feet. A confirmed old kicker, one that appears to go asleep while you are filling the pail, and just as it is filled discovers a fly on her belly, and makes a vicious lunge at it. Well, we would write that cow's obituary on short notice. You had better not trust her, if you are satisfied that she kicks from habit rather than from some disturbing cause. In the latter case you must look for the trouble, and remove it. She may be naturally sensitive or tender about the udder and teats. In that case, the milking should be begun slowly, and continued cautiously, while the cow is uniformly treated kindly. No other treatment will effect a cure. When a cow, having some local trouble that with proper handling will wear off, is treated roughly, and especially if she is tied up, or other elaborate precautions are taken against her, she is almost certain to become a confirmed kicker, for the reason that the milker, feeling safe, is sure to be rough with her, and hurts her to that degree that she resents it, and learns to dislike being milked. Especially is this the case with heifers. Bear with them to the last limit of your patience before putting them into any kind of harness. A man with a strong left arm, by a quick motion can stop the blow before it gathers headway, and thus discourage the heifer before she learns how much mischief she can do with her hind feet. Those dairymen who have cows that need to be leg-roped to milk do not know that this is a sign of a poor dairyman. No one ever saw such a thing in a well-regulated dairy. They are as useless as they are a nuisance, and the man who has not the patience to cure the fault, provided he is a young one, had better go into some other business.—"The Dairy."

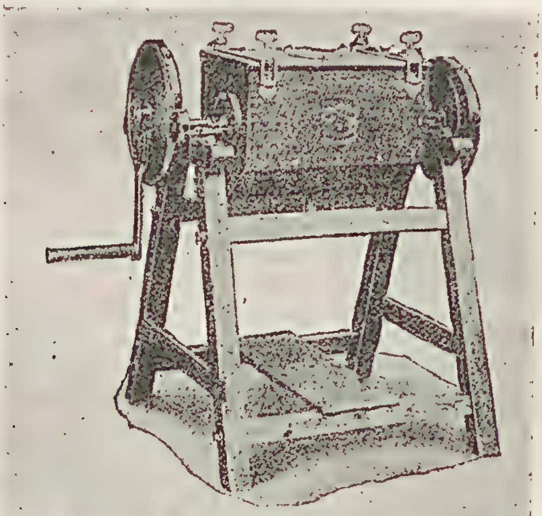
ANGORA GOATS.

It is frequently asked: Will Angora goats pay to breed? The answer to this is: Look over the fence and see what your neighbour, who keeps Angoras, has done. Say you have a homestead, or any kind of selection, of 160 acres. On that you can run 50 Angoras. The mohair from these is worth £20 per annum. But, besides this, you have the increase, which you can sell. Then there are the old goats, which can be killed, and their skins are worth 1s. 8d. per lb., and the skin weighs from 4 lb. to 5 lb. The fleece of an Angora weighs from 3 lb. to 5 lb., according to quality, and the quality varies with the purity of the breed. The fleece of a good buck weighs from 6 lb. to 9 lb., and the value of the fleece of a pure Angora is from 1s. 3d. to 1s. 8d. per lb. Half-breds scarcely pay for shearing. Now, say the average fleece weighs 4 lb., and the average price 1s. 6d. per lb., then each fleece produces 6s. It is easy to calculate what a flock of 100 goats would bring in. The principal items of expenditure would be—shearing, at £1 a score, baling, and freight. In good scrubby country the goats will feed themselves, so that there is very small expenditure for forage. On most hill farms there is to be found a proportion of stony or scrubby country, useless for grazing either sheep or cattle, and quite unfit for cultivation. There the Angora goat will thrive, hence it would be to the advantage of anyone owning such land to start a small flock of these valuable animals.

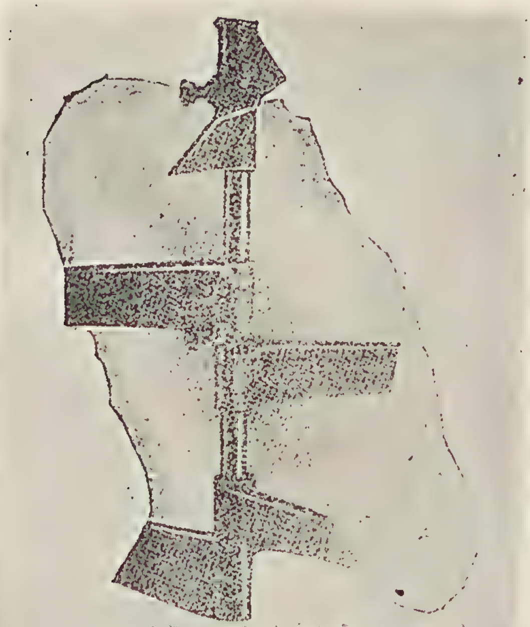
GARBUTT'S TWO-MINUTE CHURN.

At a recent London dairy show Garbutt's Improved Patent Two-minute Churn was a great attraction, and the various trials showed its efficiency, but since then it has been put to severe tests by Mr. J. Benson, the well-known dairy

expert of Buxton, and it has also come through these with the utmost success, thus fully justifying the claims of the manufacturers, Messrs. R. Boby, Limited, St. Andrew's Works, Bury St. Edmunds—viz., that the very best butter can be obtained by the use of this churn in an average time of "two minutes," either winter or summer; that the yield is increased; that the butter is superior



GARBUTT'S TWO MINUTE CHURN.



THE CHURN BEATERS.

in texture, colour, and flavour; that very great saving of time and labour is effected; and that the churn is especially easy to clean.

Mr. Benson reports that he made a large number of churning tests under various conditions of temperature, &c., and was very well satisfied with the

results obtained, it possessing the following advantages over the churns generally in use in this country:—

1. The actual churning of the cream occupies only about one-twelfth of the time necessary when churning in the ordinary way.

2. It churns the cream more efficiently—*i.e.*, there is less butter fat left in the butter milk.

3. It will churn equally well either thick or thin cream.

4. The colour of the butter is generally better and brighter, especially when churning thick cream.

5. The churn is more easily washed and kept clean.

Unlike many other quick-acting churns, this churn does not incorporate an excess of water in the butter produced. On analysis none of the numerous samples contained more than 13 per cent. of moisture. This is important, in view of the requirements of the Butter Bill, which came into operation with the new year, and which limits the water content of butter to 16 per cent. As bearing on the question of the time required to produce butter, in the final tests made by Mr. Benson four 2-gallon lots of cream were churned in one churn, washed, brined, and worked on the butter-worker within one hour. The churning temperatures varied between 54 and 60 degrees Fahr. The actual churning of the cream occupied $2\frac{3}{4}$ minutes at the lowest temperature, and $1\frac{1}{2}$ minutes when churned at 60 degrees Fahr. The fat left in the butter milk averaged only ·34 per cent.—a remarkably good result, whilst all the butters made were of excellent quality, but the best results were obtained at 54 degrees Fahr.

In concluding, Mr. Benson says the churn requires more power to drive it than an ordinary churn, but as the time taken is short this is not appreciable.

Some notes on the construction of the churn may prove of interest. It is built on a substantially-constructed pitch pine frame, strongly stayed for preventing vibration. The body of the churn is fixed in position, and does not turn. It is octagonal in shape, built of oak, the top or lid being of mahogany. The main spindle is of mild steel, driven by machine-cut gearing. The spur wheel gears on to a pinion increasing the speed of dashers to 400 revolutions per minute.

The churn is fitted with adjustable glands and lignum-vitæ tapered bushes, effectually preventing the cream from passing through the gland bearings. To the end of the main spindle a balance fly-wheel is affixed which ensures smoothness in running and ease in turning.

The dashers or beaters are simple in construction, and can in about two seconds be easily removed all in one piece, as illustrated below, for cleaning purposes and for the extraction of butter.

The interior of the churn then presents a perfectly plain surface, from which every particle is readily rinsed, the bottom being grooved, gravitating towards the discharge outlet, facilitating cleaning.

The top or lid of the churn is fitted with a large-size, circular, metal-framed, plate-glass inspection door (made easily detachable), and the opening thus formed serves for charging the churn with water for washing the butter, thus obviating the necessity for the removal of the lid until the butter is to be taken out.

The time taken to produce butter is considerably accelerated by a special form of air valve, which permits circulation of air through the cream during churning, giving to the butter excellent "keeping" qualities.—"Mark Lane Express."

Poultry.

PRESERVING EGGS.

When eggs are plentiful, the market falls to a non-paying point, especially when poultry food is dear. Then comes a time like the present, when the price rises to 1s. 6d., and, in March last, to 1s. 9d. per dozen. Nothing is easier than to obtain high, or at least remunerative, prices for eggs laid during the year. This can be attained in a most simple manner by preserving the eggs during the season of plenty.

There are two good and cheap methods of keeping eggs in a perfectly fresh state for a year or even longer. One is, by packing them in a jar and covering them with limewater, and the other is by covering them with a solution of water-glass. This is the better method, although both are good.

LIMEWATER SOLUTION.

Take 16 oz. of quicklime and thoroughly slake it in 1 gallon of cold, previously boiled, water. Stir it well, allow it to settle, then draw off the clear solution. Some mix 6 or 8 oz. of salt with the lime, but we have not found this necessary, especially as the strong brine eventually penetrates the shell and gives a salt flavour to the egg. Now, select your eggs, rejecting all that are cracked, dirty, or which give signs of age; place them in a stone or glass jar, or in a galvanised-iron vessel. We have successfully preserved them in a kerosene tin. Now, pour the clear lime water over them, and allow the upper layer of eggs to be 3 inches below the surface. Close the vessel tightly, and place in a cool dark pantry or cellar.

WATER-GLASS SOLUTION.

Water-glass is silicate of sodium. It is a thick liquid, almost transparent, and is colourless and devoid of any odour. If the water-glass has been contained in any vessel—say, a barrel—where it may have come in contact with iron in any shape, it will have a yellowish tinge, and should be rejected.

To prepare it for use, thoroughly mix, for every quart of the water-glass, 9 quarts of boiled water. As soon as it is cold it is ready for use. As with the limewater process, choose only bright, clean, fresh eggs, and pack them small end down in stone, glass, galvanised-iron, or pure tin vessels. Pour the solution over the eggs in the same way as in the limewater method, leaving the top layer 3 inches below the surface. Cover tightly and keep in a cool place until required for use. When the eggs are to be removed, draw off the solution and wash them. By these simple means eggs which at some seasons will bring only 4d. per dozen may be safely kept until higher prices rule.

EGG-LAYING COMPETITION AT ROSEWORTHY, S.A.

Mr. John Mahon, Principal of the Queensland Agricultural College, Gatton, forwards us the following copy of a letter received from Mr. A. H. Padman, Adelaide, South Australia, who was the winner of the egg-laying competition, lately concluded, in regard to the performance of his pen. (The letter is dated 28th March, 1908):—

"Ere this reaches you, the finals will be out. I hope for 1,540. (The Gatton score for Mr. Padman's pen of White Leghorns was 1,538.—Ed. Q.A.J.) The record is with you. Roseworthy will finish with between 1,520 and 1,530. Mrs. Kinnear's pen has given me a great run, and has still an equal chance with mine of winning—not 20 eggs between us for twelve months. Trust my pen will get away safely to Mr. James. They will probably moult heavily after

the voyage. I shall esteem it a favour if you will accept the reserve birds, if any, as a slight recognition of my appreciation of the wonderful record put up under your care. If you can allow the actual attendant to have some benefit, I shall be pleased. I desire to record my great thanks to you for your unfailing courtesy and compliance with my various requests for information and figures throughout the competition now finishing. I trust at some future time to be represented again under similar conditions."

Mr. Mahon adds:—"I may state that the final figures in the Roseworthy competition give Kinnear (first) 1,531 eggs, and Padman (second) 1,528 eggs. The pen competing here (Gatton) is to be sent direct to New Zealand, where a Mr. James, of Auckland, has purchased the six birds for £35."

In a later letter Mr. Mahon states that he has been offered £4 4s. for the two White Leghorns presented to the College by Mr. Padman. It is, however, intended to keep them, mate them with one of the best College cockerels, and raise as many chickens as possible from them. A limited number of settings will be available for disposal at £1 1s. each, f.o.b. Gatton.

BEWARE OF CARBOLIC ACID.

A medical man gives a decided warning against the free use of carbolic acid on the poultry. In reply to the query, Would you please explain why some people claim that they have had great success in curing diarrhœa in their chicks by the use of carbolic acid, when others claim the contrary? he says:—

As to the wonderful properties of carbolic acid (carbol) I shall herewith give for your own benefit and that of all readers an extract from the price-crowned work on "War-Surgery," by Professor Esmarch, M.D., the world-famed surgeon and professor of surgery, a surgeon-general of the first class in the German army, and a member of most of all the important scientific bodies of the globe. He says:—

Carbolic acid is a very effective antiseptic. A watery solution of 1·100 stops upon longer contact the development of microbes: the germ development becomes entirely inhibited, though only after a twenty-four hours' contact with a concentrated solution of 5·100. Solutions in oil or alcohol are, according to Professor Koch (the famous Cholera-Tubercle Koch), without any antiseptic effect. But carbolic acid is very poisonous, and that not on internal use only. For even when applied externally in the form of washes, compresses, &c., to wounds, abrasions of skin, and even the normal skin, it is easily absorbed into the system, and does (particularly in children, but also in those adults who are suffering from cachetic conditions, anæmia, kidney troubles, &c.) cause quite often very severe symptoms of poisoning, acute (collapse), as well as disturbance of digestion, vomiting, maramus.

It also irritates the skin, particularly when used moist, and causes erythema and eczema, often combined with high fever, and strong solutions irritate the surface of wounds to such an extent as to cause severe secretions, yea, even as Lister called it, antiseptic putrefaction—gangrene!

The professor adds: "Carbolic acid is, therefore, much less used now than it was in the days of Lister, when it dominated as an antiseptic."

This was written by one of the foremost authorities in the medical world in 1885, has been recognised and acknowledged as true by others, but, alas, now after a lapse of twenty years, carbolic acid is still the standby of profession and laity!

We have treated this question at particular length because the belief in the healing power of carbolic acid is so general among the people, and its true nature is so little known. We must warn our friends of its use, to protect them, their families, and fowls, which already have to stand so much maltreatment.—Exchange.

The Orchard.

SOME GOOD SPRAYS.

Spraying must be done thoroughly. By thoroughly is meant that the tree should be wet all over, and on both sides of the leaves. It should be enveloped in a mist-like spray (just enough to damp it). An insect or a fungus growth does not search after the mixture that is to kill it, but the mixture must be placed where that insect or fungus has taken up its abode; also, spraying should never be done in wet weather, as the rain washes the mixture off the tree before it can do much good.

The strength of such applications as Bordeaux mixture, kerosene emulsion, &c., must be regulated by the season and the resisting power of the plant sprayed, for plants should not be injured when remedies are applied.

Bluestone may be used in strong solution in winter when the leaves are off the tree, but even a weak solution in spring will sometimes destroy the leaves.

In spraying, the following precautions must be observed:—

1. All substances used for spray mixtures should be properly labelled and kept in places by themselves.
2. Solutions containing copper sulphate, arsenite of lead, or any corrosive material should be made in wooden or earthenware vessels.
3. Arsenical sprays should not be applied to fruits within a few weeks of their being picked.

The following list may be of convenience to fruitgrowers, giving, as it does, a summary of the different pests and diseases, with the remedies to be applied:—

THE RED SCALE OF ORANGE (*Aspidrotus coccineus*).—Introduced pest. This is an oyster scale. Eggs laid in summer and hatch the following spring. Females are viviparous (produce young alive), and are wingless. Winter passed in old scale. Spray in late winter with kerosene emulsion or resin compound. Scale attacks fruit shoots and leaves of tree.

THE COMMON BLACK SCALE (*Lecanium olea*).—Attacks most of our fruit trees, but principally citrus. Spray with kerosene emulsion.

THE COTTONY-CUSHION SCALE (*Aspidrotus perniciosus*).—Native pest of the wattles. Attacks branches and twigs of citrus. Young hatched in spring (August and September). Three or four broods in one year. Spray in spring and summer with kerosene emulsion (1 part to 15 of water). In South Africa, deciduous fruit trees are attacked as well as citrus. Eggs of last brood remain till next spring.

PEARS

PEAR MITE (*Phytophtus pyri*).—Introduced pest. Attacks leaves of pear trees, causing unsightly galls, also injuring the leaves. Hybernate during winter in leaf buds and under bark of last year's shoots. When spraying for this pest, the mixture should be projected upwards, as the galls containing the insects are on the underside of the leaves. The mite lives inside tissue of leaf. It spreads principally in spring, and this is the only time when it can be dealt with. During September, spray three or four times (a week apart) with weak kerosene emulsion.

THE PEAR AND CHERRY SLUG (*Selandria cerasi*).—Introduced pest. Attacks pear, quince, cherry, and plum trees. This pest is the larvæ of a saw-fly, and attacks the leaves of the trees, gnawing off the upper surface of the leaf, thereby causing great damage. The trees should be treated before the fruit is far advanced, and while the tree is not in flower. Spray with kerosene emulsion or with hellebore (1 lb. to 40 gallons of water) when the fruit is off the tree.

PLUMS.

THE PLUM APHIS.—Habits similar to peach aphis. In early spring, before buds burst, lay roots bare and spray with kerosene emulsion. After pruning, spray head of tree with kerosene emulsion or resin compound.

CHERRIES.

THE CHERRY GREEN BEETLE (*Diphucephala colaspidoides*).—Native pest. Damage done by perfect insect. Eggs supposed to be laid just beneath the surface of the soil or about the roots of native trees. Perfect insect appears about "cherry time" (November). Attacks all fruit trees. Spray when not in fruit with Paris green.

THE RUTHERGLEN FLY PEST.—Thought to be a native pest. Mature insect does damage by perforating the fruit. Four broods in a year. Attacks all fruits (especially soft fruits) as they are ripening. Keep all weeds, rubbish, &c., down. Spray with a volatile spray (1 pint of benzole to 20 gallons of water).

THE COMMON VICTORIAN LOCUST (*Pachytelus australis*).—The locust is a world-wide pest, and attacks all plants, trees, &c. The eggs hatch in early summer, and are laid by female on slopes almost free from vegetation. If spraying with Paris green, in combination with such remedies as "locust fungus," poisoned bait, &c., is carried out, this pest should not make much headway.

PEACHES.

THE BLACK PEACH APHIS (*Myzus cerasi*).—Introduced pest. Attacks shoots of peach, apricot, plum, and cherry in spring and early summer. Winter passed on roots of tree. Disappear from head of tree when hot winds set in. Spray with kerosene emulsion (lukewarm when in leaf, but it can be sprayed on hot —130 degrees Fahr.—when tree is dormant, 1 part to 15 of water), resin compound, tobacco water and soft soap, or sulphate of potassium.

THE GREEN PEACH APHIS.—Attacks trees when in leaf. Habits similar to black peach aphis. When aphis leave head of tree they congregate around base of roots. Spray when trees have shed their leaves, and again just after swelling of the buds. Remedies similar to black peach aphis.

VINES.

THE VINE MOTH (*Agarista glysine*).—Native pest. Eggs deposited on vine leaves, stalks, &c. Two or three broods in a year. Larvæ strip leaves, starting from the outside and eating towards mid-rib. They sometimes attack young shoots. Spraying with Paris green (1 lb. to 200 gallons of water), treacle 1 lb., should keep this pest in check.

CITRUS.

THE CASE MOTH OF THE ORANGE (*Metura elongata*).—Attacks fruit trees, eating off the leaves. Young hatch in autumn and spring. Mature female is legless and wingless, and lays its eggs in bottom of case. Spray with Paris green (1 lb. to 180 or 200 gallons of water). Damage done by larvæ.

THE SAN JOSE SCALE (*Aspidiotus perniciosus*).—Introduced pest. Attacks all fruit trees, usually the growing shoots. Attacks peaches, apples, apricots, and pears principally. Adult females are viviparous (produce young alive) during spring and summer. Hybernate during winter under old bark, in crevices, &c. In spring, young insects spread from old branches on to young shoots and fruit. When pruning (if the season is favourable) cut away as much diseased wood as possible, and spray with kerosene emulsion (full strength), and in summer with kerosene emulsion (half strength) or resin compound. This scale has proved a terrible pest in America, and if not checked may repeat itself here. It is supposed to be the worst of all scales.

THE LIGHT-BROWN APPLE MOTH (*Cacœcia responsana*).—Supposed to have made its appearance from native trees. Habits similar to codlin moth, and it tunnels into fruit, causing premature ripening. Spray two or three times with

Paris green (1 lb. to 180 to 200 gallons of water) when the fruit is setting. Bandaging as for codlin moth also recommended.

THE PAINTED APPLE MOTH (*Teia anartoides*).—Native pest of the wattle. Attacks leaves of fruit trees, principally apples. Can be prevented from attacking trees by a spraying with kerosene emulsion. To kill grubs outright, a spraying with 1 lb. Paris green to 180 to 200 gallons of water.—"Fruit World."

PLUMS AND PEACHES.

(By F. A. WAUGH and G. O. GREENE, Massachusetts.)

Reports are here given on plums and the pruning of peach trees.

The report on plums deals principally with the behaviour of a large number of varieties grown at the station. Bradshaw has proved one of the best of the Domesticas grown, while Burbank, of the Japanese sorts, has proved the most profitable and productive market plum at the station.

Experiments were made in marketing plums in 3-lb. baskets, such as are used for grapes. This proved a satisfactory package, as it furnished about the quantity of fruit desired by most purchasers.

Plums for canning were packed in Jersey peach baskets holding 16 quarts; this proved satisfactory, cheap, and convenient. Most markets were found not to be fastidious with respect to the form of the packages used for plums, and any small meat basket or box will answer if the fruit is of good quality and well packed.

In pruning experiments with peaches, one row has been left for nine years without pruning. These trees are quite open-headed, and have generally assumed a vase form. The lower part of the main branches is bare, and the fruiting wood is sparse, weak, and high up in the trees. The trees are much less thrifty and vigorous than pruned trees of the same variety. As a result of this lack of vigour, a number of trees succumbed to the cold during the preceding winter.

A row of trees next to this has been headed back moderately two or three times, as a result of which they are thick topped, with a good deal of feeble, sappy growth on the inside. The annual growth, however, has been much more vigorous, and the health of the trees better than those not pruned. More and stronger fruit buds have also formed. The main fruit branches are shorter and stronger, and more capable of sustaining a large crop of fruit. The experiment is believed to show conclusively that the best form of peach-tree cannot be secured and maintained without pruning.

During the past three years a special experiment has been made in heading back peach trees in the spring. The conclusion reached relative to this system is that "the heading back of peach trees in early spring is good practice, and in all cases advisable; in this pruning from one-third to two-thirds of the wood of the previous year should be removed," depending upon the number of living fruit buds on the one-year-old wood. When from any cause there are no fruit buds, advantage should be taken to cut back with comparative severity. Only in extraordinary instances should the cutting extend back into two or three year old branches.

Some experiments were made in summer pruning peach trees. With early spring pruning it had been noticed that many feeble and useless shoots grew in the centre of the tree. It was thought that if a considerable quantity of the new leafy shoots on the outside of the tree were removed, thus admitting a reasonable amount of light to the inside of the tree top, some benefit might result.

"In no case were the results of this treatment convincing. The formation of strong shoots with fruit buds on the interior branches was never visibly promoted. The outside branches which were allowed to remain seemed to profit

somewhat by the removal of their crowding neighbours, and this was apparently the chief benefit derived from the experiment. On the whole, it does not seem to us that this practice is to be greatly recommended."

Cutting back the young growth of the outside branches to correct overgrowth did not give satisfactory results. The stopping of the growing shoots was usually followed by the pushing out of side buds and shoots lower down, which were nearly always too weak to set good fruit buds.

Considerable winter injury was sustained by peach trees in both 1903-4. The damage was not serious in 1903, but in 1904 the trees were seriously weakened by freezing, and some were killed outright. In treating the injured trees one block was left entirely without pruning, another was pruned in midsummer after the trees had started, a third was cut back from two-thirds to three-fourths of the previous year's growth, and a fourth was headed back near to the trunk, only the stubs of the main branches being left. The following table shows the results:—

EFFECT OF DIFFERENT METHODS OF PRUNING FROM PEACH TREES.

Method of Pruning.	Total Number Pruned.	Living, Autumn of 1904.	Dead, Autumn of 1904.	Living.
Trees unpruned	121	113.0	8.0	93
Moderately cut back	48	47.5	.5	99
Severely cut back	68	55.0	13.0	81
Cut back to stubs	46	24.0	22.0	52

While a large number of the unpruned trees lived, the growth made by the headed-in trees which lived was much better than that made by the unpruned trees. It was the judgment of many who saw the trees that the ones moderately cut back showed the best growth and were in the best condition. The experiment is also believed to point out that trees seriously weakened by freezing should not be cut back close to the main trunks.

GIVING MEDICINE TO HORSES.

The practice of giving medicine to horses by elevating the head and pouring it into the nostrils is a foolish method. Providing the medicine is of a non-irritating character, so as not to inflame the membrane of the nasal chambers, and providing, again, that the pouring is done through the left nostril, and again providing that the head is not elevated too high, so as thoroughly to open the epiglottis, then the liquid will go direct through the œsophagus (gullet) to the stomach. But when the remedy is a fiery liquid, like ginger or pepper tea, then the sensitive membrane of the nasal chamber is more or less irritated by the dose, and serious harm may follow. Should anyone administer medicine through the right nostril, there is always great danger of the horse being strangled, as the liquid arrives in the pharynx, and, as the horse does not swallow naturally, strangulation may follow when he breathes. The left nostril is in a line with the œsophagus (gullet), and when the head is elevated just at the right angle the liquid will run down all right. But raise the head too high, and the valve (epiglottis) that closes the end of the windpipe will be lifted, and the liquid will as readily run down the windpipe as the gullet. The practice is dangerous, and, what is more, is unnecessary. With a drenching bit or with even a common two-tined pitchfork, an assistant can easily elevate the head of any horse sufficiently to pour medicine from a bottle down his throat easily. Let fools practise fool methods, and wise people strive to practise common-sense methods in administering medicine to animals.—"Exchange."

Botany.

CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

BY F. MANSON BAILEY, F.L.S., Colonial Botanist.

Order MENISPERMACEÆ.

TINOSPORA, Miers.

T. Berneyi, *Bail.* Queensl. Agri. Journ., Vol. XVIII., 76. "Croydon Ivy." An extensive climber with yam-like rhizomes. Stems cylindrical, 2 to 3 in. diameter, smooth, glabrous, or somewhat hoary when young, more or less marked by lenticels; when the main stems have been cut through, and thus the plant's connection with the ground is severed, the upper portion of the plant, by adventitious roots from its base, frequently renews the connection with the soil, a feature known to be performed by another species in Malabar. Leaves thin, glabrous, on strong-growing shoots on the lower parts of the plant, cordate, 3½ in. long by 4½ in. broad, 5-nerved at the base, and closely reticulate; petioles slender, about 1½ in. long; leaves on the terminal or more slender branchlets, lanceolate, cuneate at the base, 1 to 2 in. long and ½-inch broad, thin, glabrous, 3-nerved at the base, petioles slender, 1 in. long. Racemes female, 1½ to 4½ in. long, flowers numerous; bracts narrow-lanceolate not 1 line long, pedicels about 1 line long. Outer segments of flowers about 1½ line long, broadly-ovate, and appear to be yellowish, the inner ones much smaller. Carpels 3 or more. Drupes red, oblong, about 4 lines long, on thick fleshy pedicels of about 1½ line.

As I have received more complete specimens, the above should be substituted for the previous notices of the plant.

Hab.: Spring Valley, Hughenden, *F. L. Berney;* Croydon, *J. A C. Wilson,* who says that the plant is deciduous.

Order ONAGRARIEÆ.

ŒNOTHERA, Linn.

Œ. sinuata, *Linn.*, **forma.** A softly pubescent prostrate or decumbent plant. Leaves oblong-apiculate, and more or less lobed in the lower half, upper ones sessile, lower ones petiolate, 1 to 3 in. long. Flowers sessile in the upper axils, ovary about 1 in. long. Calyx tube slender, exceeding 1 in.; lobes rather shorter, narrow. Petals obcordate, about as long as the calyx lobes, yellow, more or less stained a reddish-purple in the centre. Stamens rather shorter than the corolla. Capsule 1½ in. long, slightly curved, obtusely 4-angled.

Hab.: A naturalised plant from America, now forming large patches on the sandy beach at Redcliffe. Patches often may be met with on these sands; also, of *Œ. longiflora*, another naturalised species of the genus. Both are showy plants, and have escaped, probably, from garden culture.

Order CUCURBITACEÆ.

CUCUMIS, Linn.

C. myriocarpus, *Naud.* Gooseberry Cucumber. Plant annual, green, scabrous, branches angular-striate. Leaves 1½ to 2 in. long and wide, upper ones much smaller, base cordate, margins denticulate, palmately 3 to 7 lobed; petioles hispid, usually rather long. Peduncles much shorter than the petioles. Tendrils slender, short, angular. Male flowers solitary or fasciculate, calyx tube narrow campanulate, teeth subulate. Corolla with ovate-acute segments.

Stamens glabrous, filaments filiform, anthers oblong, subglabrous. Female flowers solitary, peduncles of fruit subfiliform. Fruit numerous, round, about 1 in. diameter, densely or sparingly beset with weak bristle-like spines; seeds ovate-oblong.

Hab.: South Africa; has become naturalised in the South-western districts of Queensland, and supposed to be injurious to horses.—*Inspr. B. F. Wood.*

Order FILICES.

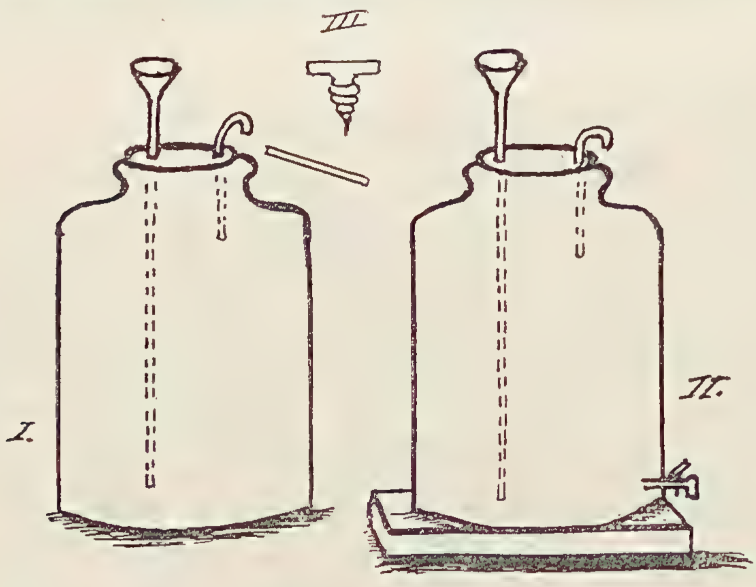
ASPIDIUM, Swartz.

A. molle, *Swartz*, **forma Keffordii.** This plant differs from other Australian forms of the species in that the apex of the fronds and most of the leaflets are much divided into pretty tassels, the fronds are also of a deep glossy green, and the rhachis purplish.

It was met with by Mr. W. R. Kefford on his recent visit to the Johnstone River, and is well worthy of garden culture.

HOW TO MAKE OLIVE OIL FOR DOMESTIC USE.

To try the quantity and quality of the oil of different sorts of olives (or to make small quantities of oil), take an earthen jar and bung with a water-funnel and a discharge pipe (which can be made with pieces of small gas piping). The bung can be made airtight by putting round it a washer of leather or gutta-percha, and a tapered screw in the middle to screw down when the bung is fitted in the jar. Put 100 lb. of crushed olives in the jar, bung tight, let stand a while, then pour water down the funnel, and the oil will be forced up through the discharge pipe.



The fruit can be crushed with a strong hand sausage machine. A piece of sponge for strainer under the discharge pipe will prevent it getting clogged, and will filter the oil clear.

For Virgin oil the olives should be ground immediately on gathering, and the oil run on to cold water. For a dark fatty oil they should be dead ripe, and allowed to dry a little—spread out, but not heaped, or they will ferment, get mouldy, and make only rank oil.

For common oil mix hot water with the pulp.—"Garden and Field."

Horticulture

FLOWER GARDENING.—No. 4.

By THE EDITOR.

PLANTS SUITABLE FOR OUT-DOOR CULTURE.

Geraniums and Pelargoniums.

Few florists, professional or amateur, trouble themselves to give any directions for the growing of geraniums; consequently, I have to go back as far as 1875 to find anything about these flowers, and in that year Mr. A. J. Hockings, who, in the early days, was the premier florist in Queensland, and whose son still keeps up the prestige gained by his father, published a little book entitled "The Flower Garden in Queensland," the instructions in which, for the management of a flower garden, are as valuable to-day as they were in the seventies. In this book we find the following notes on the cultivation of the geranium:—

"The geranium will grow under such unfavourable circumstances that it may appear superfluous to give directions for its cultivation; but it is so seldom that a well-grown specimen is to be seen, and some of the fancy and show varieties (pelargoniums) would so well repay the trouble, that it has been thought desirable to do so."

In W. Adamson's "Australian Gardener" (Melbourne), also I find instructions for the growing of pelargoniums.

Mr. Hockings wrote:—"The soil for geraniums is of the utmost importance. It must be sandy and free in the open border, and ample drainage must be provided for such as are grown in pots. A compost, in which almost any plant may be grown to perfection, formed of well-rotted turves, cow dung, and peat, with the addition of silver sand, would grow them well. Some growers mix a quantity of broken brick, about the size of peas, in the potting earth. If the soil be too rich, a long-jointed luxuriant growth is induced, which gives the plants a straggling appearance, whereas a sturdy, short-jointed growth should be aimed at, with rich, well-developed foliage and bloom."

Plants for Show.

When the trusses of bloom are formed, it will generally be desirable to apply liquid cow dung to these—1 quart of cow dung mixed with 6 quarts of water—and, when settled, let the soil be watered with the liquid every fourth day until they bloom, pure water being used on other occasions.

Garden Culture.

Some of the most healthy of the fancy and show geraniums to be seen in the vicinity of Brisbane are grown in the open crumbling soil, largely mixed with gravel, which is on the neighbouring ridges. Thorough drainage is, in fact, the chief requisite in the successful cultivation of these old favourites.

Propagation.

The zonal varieties strike from cuttings with such facility that no instructions are necessary. The fancy and show varieties, generally called pelargoniums, are, however, not so tractable. Cuttings of these should be taken in July, when they first start into spring growth. The extreme ends of the new shoots are taken, about 3 inches in length, cut clean, just under a joint. Remove the lower leaf with a sharp knife, and dibble the cuttings in rows in an open sandy or gravelly soil, in a shady border. Some of the best sorts, which it is almost impossible to grow from cuttings from the head, may be

increased by cuttings from the root which have a few fibres attached. All of them may be propagated by layering during the early summer months, just as the green stems are assuming a mottled brown appearance, showing that they are getting ripe. At this stage of their growth they root very freely in suitable soil. The ivy-leaf geranium belongs to the pelargoniums.

PELARGONIUMS.

"These," says Mr. Adamson, "are amongst the most popular plants of the day; they are equally suitable for pot or open ground culture. The same treatment will suit both show and fancy varieties, except that the fancies being more delicate must have a lighter soil. Cuttings may be put in when the plants are cut down after blooming, either in pots, boxes, or the open soil, in a frame with a movable shade. Cuttings of the young shoots taken in spring and placed in the heat also strike freely. As soon as rooted they should be potted singly into small pots, and, when established, the points must be pinched out, and the same with the side shoots as they grow, so that bushy plants may be formed. The first year they should be shifted whenever the roots have begun to spread around the sides of the pots, in order to grow them as large as possible until the flower buds appear. When flowering is over, the pots should be plunged in the soil in an easterly aspect, where they will get the morning sun to ripen the wood; when the shoots have become moderately hard, they must be cut back to such an extent that bare stems will not be seen when the plant is again in growth. When the buds have broken and the young shoots have grown about an inch, the plants must be taken out of the pots, shaken out of the old soil, and repotted in pots of as small a size as will accommodate the roots; set in a close frame until re-established, then gradually inured to the open air, but not exposed to violent rains, and return to the greenhouse any time in March. The young shoots must be tied out as they advance, and may be stopped when they have made 3 inches of growth; and, after they have broken again, the plants should be shifted into their blooming pots—the earliest in April or May and the latest in July or the beginning of August. They must be kept near the glass, have abundant ventilation, be allowed plenty of room on all sides, and be fumigated every third week. A lean-to house is the most suitable, with a stage, on which they can be raised or lowered as necessary, so as to keep them near the glass."

I must here point out that the above directions apply more to a climate which, like that of Victoria, is liable to sudden changes, and where the winters are severe. In Queensland, geraniums and their congeners may be grown all the year round in the open, provided they are not exposed to strong westerly winds.

"The soil should be composed of half loam and half peat and manure, with sufficient sand to keep it open. As plants of the zonal section flower almost continuously, they may be cut back either in autumn or spring, and potted progressively as required. They may be placed in a warm temperature in spring if wanted to flower early. During summer they may be fully exposed out of doors, with their pots plunged in the soil. The young shoots may be stopped at any time. If required for decoration in winter, flowering should be prevented during the summer season. Tricolours colour better if placed where they can be in shade at mid-day."

SOME GOOD VARIETIES TO PLANT.

Single Zonal Pelargoniums.—Aurora Boreale, Cremorne Scarlet, Charles French, Dryden, Dr. Nansen (pure white), Miss Fenn, Shelly, &c.

Double Pelargoniums.—Dr. Depar, Golden Gate, F. V. Raspail Improved (the best double scarlet in cultivation), Mrs. W. E. Galdstone (pure white, shaded flesh-pink in the centre), White Abbey, Yarrner Robinson, Madame Charotte (semi-double).

The Regals at their best are splendid flowering plants, but are not often seen to advantage in the open garden. The trusses and individual flowers are larger than the show kinds, and the petals are frilled and of much greater substance. Fancy, or "ladies'," pelargoniums are a smaller-growing type, producing neat trusses of bloom. They were very popular at one time, but are now rarely seen, except in nursery collections. A much more generally grown class are ivy-leaved or climbing varieties, some of which are among the most effective and rapid-growing of climbing plants. These are specially useful for covering unsightly places in the garden, but one drawback to their general value is their liability to become a harbour for snails.

DAHLIAS.

The dahlia is so easily grown in the genial Queensland climate that it seems superfluous to give any other advice about them beyond recommending the novice to the most reliable nurseryman. Still, a few remarks will not be out of place.

The plants may be raised from seed, from tubers, or from cuttings, the latter being the best plan for the amateur who wants to get flowers with as little delay as possible. The soil for the dahlia should be a rich, deep, friable loam, which should be trenched to a depth of at least 18 inches, and, if the soil is not naturally rich, a spadeful of well-rotted dung should be added where each root is to be planted. The tubers should be placed about 4 to 6 feet apart, and one or more stakes should be driven into the ground, ready for the support of the future plant. As the latter advances in growth, it should be carefully tied to the stake, as the brittle stems are very liable to be torn off during high winds. In order to produce fine blooms, all weak side shoots and superfluous suckers must be removed. As the best flowers are produced at the end of the summer, after the extreme heat has passed, a portion of the plants should be kept back until the beginning of December. The tubers may be planted for a succession of bloom, from the beginning of August to the end of October, at about 3 inches under the surface of the soil.

As soon as the plants are past their beauty and cease to produce good blooms, pass a fork or spade gently under each root, and slightly lift them. The stems will then wither, and in a week the tubers will be ripe and ready to take up and store away in some dry shady place to await the next planting season. The easiest and best way to increase dahlias is, as I have already said, to plant the tubers. These may be divided, as is done with the potato. Every eye or bud with a small portion of the bulb attached will produce a plant. Cuttings of the stems will also root freely and make good plants if they are taken as soon as they are 1½ inch long.

Single-flowered dahlias are well adapted to flower borders, where they make a fine show, flowering through the summer season. The double-flowered varieties produce the best effect when planted in large groups. The cactus dahlias are also well adapted to being planted at the back of flower borders or in groups. The Collarette is a very pretty single dahlia, possessing around its disk a series of florets, producing a highly ornamental effect. The single and double cactus, the Pompom, the single Tom Thumb (a new dwarf), and the giant single Perfection are amongst the best.

CARNATIONS AND PICOTEES.

Next to the queen of flowers—the rose—the carnation, owing to its beauty and delicious fragrance, takes a high place in the estimation of all horticulturists. The charm of their form, the variety and disposition of their colour, unite with their fragrance to render them unsurpassable by any other flower. In the temperate districts of Queensland they may be grown with much success in the open border and even in some of the warmer portions of the State if a little regard be paid to aspect and shade.

The carnation has one advantage over the rose in that it will flourish in positions where the rose would make a complete failure. In smoky districts that would be death to the rose, the carnation would be in its element. Carnations are usually divided into four classes, as follow:—Selfs, Bizarres, Flakes, and Picotees. Selfs are of one colour only, without marks or shadings; Bizarres are those in which the white ground colour is striped with two colours, one being darker than the other; Flakes are those in which the ground colour of the petals is striped with only one colour—purple, scarlet, or rose.

The properties of form in the picotee are similar to those of the carnation, but the distinction between carnation and picotee is that the colour of the former is disposed in unequal stripes, going from the centre to the outer edges, and that of the picotees is disposed on the outer edges of the petals and radiates inwards, and the more uniformly this is disposed the better.

The ground colour of the picotee should be white or yellow, pure, and without blemish. In some instances the more delicate-edged picotees appear to be of less robust character than carnations generally, and it is probable that a considerable amount of breeding in-and-in to secure the fine beaded edge may have induced constitutional weakness. It may be fittingly described as the feminine of the more muscular carnation. The picotees are divided into three sections—red edged, purple edged, and rose edged. Although the picotees are often classed separate from carnations, they both require the same treatment, and both may be raised from one pod of seed.

CULTIVATION.

The carnation is one of the easiest cultivated of plants, and will lend itself to the various forms of garden ornamentation. It can be grown in the mixed borders, on single lines, or, better still, in beds by themselves. The first consideration is the preparation of the beds, which, for several reasons, should be undertaken some time beforehand, in order that the ground may have time to settle before the plants are put in, as a firm root run is one of the first principles of successful carnation culture. Time and a good soaking rain will bring this about more effectually than treading. Stiff or clay soils do not require compressing as lighter formations, but in loose soil plants will not thrive to any extent or for any length of time. Planting may commence in autumn, through the winter, and early spring, but the best time is early autumn, and on no account should the plant be pot bound, but just started to grow in the pot and transferred to its blooming quarters. Carnations are never satisfactory if once pot bound. A piece of ground in an open and sunny position, yet sheltered from strong winds, should be chosen, if possible. The ground should be deeply dug—a good double digging—that is, two spits deep—if the ground is old garden soil, and a thick coat of well-rotted cow manure well mixed with the soil. Do not fall into the error of making the ground too rich with manure. This would have a worse result than the other extreme of poverty. Extra nourishment can always be supplied later, with the best results, by means of artificial manure or mulching and liquid manure in dry times.

Heavy soils will be greatly benefited by the addition of sand or grit—sea sand is excellent, as it contains a small percentage of salt. Burnt soil is also good. Carnations make quick and strong growth in charred earth. If the soil be a very light one, it will be specially benefited by a dressing of burned garden refuse. Carnations are also very fond of lime or old mortar, but it must not be overdone. Bonedust and superphosphate are the best fertilisers, dusted over the ground at the rate of 3 lb. per square rod. Soot is cheap, and an excellent fertiliser.

The beds should be 4 feet wide, raised fully 6 inches higher than the path; these beds will hold three rows of plants, 15 inches apart. One of the secrets of successful culture is firm planting, spreading the roots out neatly (that is, if the plants are not in pots). Press the soil firmly down well around the

plants. The roots should be well covered with soil, but at the same time do not bury the plants in a hole, rather let their foliage stand clear of the surrounding soil. If in damp ground, let each plant stand on a slight mound, and receive a good watering to settle the soil around it. If from pots, plant the same depth as the pot they were in. If in heavy soil, some light material may with advantage be placed around before the heavy soil is filled in.

The after cultivation consists principally in keeping the ground free from weeds, giving water in dry times (though none will be required during winter), supporting the flower stems as they rise, thinning the buds more or less, and destroying earwigs and other pests.

Top dressing is a valuable aid to the cultivator, especially where the soil is shallow, sandy, or impoverished, or when the plants make poor growth. The best time to apply it is when the shoots start to rise in spring and before the buds show. A good top dressing consists of leaf mould, old hot-bed manure, some sifted mortar rubbish, with a good sprinkling of soot and bonedust, mixed well together and spread over the bed to a depth of 2 inches, working it around and between the plants. Water this well in, and the result will soon be apparent, for the roots will begin to work, and soon improve the appearance of the plants. As the flower stems rise in the spring they should be supported, as in the early stages of growth they are very brittle and easily broken by wind. Laths used by plasterers are cheap and suitable. One-year-old plants are best supported by each shoot being tied out to a lath; older plants would need four laths placed in a square with reaper twine wound in the shape of hoops. This, I find, gives the plant a good support and a graceful appearance. Nothing looks worse than slovenly tied-up carnation plants. As the buds show form, if good flowers are required, they must be thinned. For ordinary purposes little or no thinning is required, but for show purposes not more than two buds should be left on a strong shoot, or one on a weak one. After the plant has done blooming, the flower stems should be cut right down to their base.

PIPINGS OR CUTTINGS.

These are made as short as possible, but there should be a stem with three joints to insert in the soil. The bottom leaves should be carefully removed and the stem cut clean off under the last joint. Give the soil a good watering with a fine-rose watering-pot, so as not to disturb the surface. Thrust the pipings in to the depth of the stem, but do not shorten the top leaves, as some recommend. When the pots are filled, at about 2 inches apart, water sufficiently to settle the soil, and shade from the sun until they have struck root. Water occasionally as required, but not too copiously, or they will "damp off." When rooted, prepare a bed and plant them out 6 inches apart. From this bed all the intermediate plants may be withdrawn as required.

LAYERS.

The following instructions, by Glenny, are taken from the late Mr. A. J. Hockings' "The Flower Garden in Queensland":—

"Cut off the leaves pretty close from all but the top three joints; then make an incision in the stem, on the under side, half-way between the second and third joints, under the lower leaves left on, and to nearly the middle of the stem, bearing the knife upwards, right through the second joint, and cut off at the joint the sloping piece below it. The place to peg it down on must be dug up or loosened with the knife, and a little sand should be mixed among it. Then, with a peg, made like a little hooked walking stick, 4 inches long, peg down the layer, so that the whole of the slit part is below the surface. Finally, water, to settle the earth about them."

In the warmer parts of Queensland the slit part should be 2 inches under the soil, or the surface should be well mulched. Before making layers it is desirable, whether in pots or in the open border, to stir the soil and mix a

good compost dressing of half road sand and half leaf mould, or dung rotted into mould. The layers will root in the pots in a month or six weeks, but should be left attached to the plant until they have plenty of fibre, and, when thoroughly rooted, they may be cut off and potted, two in a 4 or 5 inch pot, in soil from rotted turves, but no dung, and plenty of crocks for drainage.

SOME GOOD VARIETIES.

The following is a list of a few of our best Queensland-raised varieties:—Delicator, Tiger, Robert Ward (stripes); Victor, Nigger, Hindoo Improved (dark); Variables (peach); Sunrise (bright red); Bailey's White (white); President Kruger (red); Mrs. Proudfoot (improved); White Clipper (white); Purity (white). The yellow bloom, well known in England, is, I believe, not grown in Queensland, but if any amateur could succeed in producing a really good yellow bloom there would be a great many inquiries for it, that colour being very rare in the State.

A VALUABLE CARNATION.

About two years ago a seedling of a new variety of carnation, which has been named The Aristocrat, was raised by a florist at Cincinnatti, U.S.A., who sold it for £8,000. This exceeds the previous highest price given for a new variety of this flower by £2,000. It would appear incredible that such an enormous sum should be given for one plant, but it must be remembered that there are tens of thousands of wealthy and well-to-do amateur horticulturists in the United States as well as in Europe and other parts of the world, not to speak of the great army of professional gardeners, who would willingly pay from 5s. to £1 per plant for a really good new flower. Not so long ago new varieties of potatoes sold at from £3,000 to £300,000 per ton, whilst £50 was offered for a single tuber.

RAISING PLANTS FROM SEED.

BY G. WILLIAMS.

The following interesting paper, as reported in the "Rockhampton Bulletin," on the above subject was read by Mr. G. Williams, at the March meeting of the Central Queensland Horticultural Society, at Rockhampton:—

"The propagation of plants by seeds is the most natural mode, and is generally considered the most satisfactory, excepting where the exact counterpart of a plant is desired. With some plants, more particularly amongst those of a ligneous nature, and which have been improved by cultivation and selection, the tendency amongst seedlings is frequently to revert to the original. Though an occasional further improvement may be noted or brought about artificially, this is exceptional. Consequently, other means are employed to propagate and diffuse such varieties with their true characteristics.

"In connection with the raising of plants from seeds, the essentials of success are, briefly, that the seeds have been properly ripened and properly kept till the period of sowing, and that they be sown in a proper manner under favourable circumstances. As to perfection and maturity, this is a matter over which the planter has usually but little control, being mainly dependent on the agency of others to procure his supplies. Consequently, the seedsman gets quite a full share of the blame for non-germination. The fertility, particularly of small seeds, cannot well be determined without the aid of a miscroscope. Simple tests have been recommended; but their application can only be reliable in the case of large seeds, and it is usually to those of small size that the horticulturist is indebted for failures. The length of time which vitality remains unimpaired must be considered in respect of perfection, for whilst in some it may be almost indefinite, in others it is very brief. With herbaceous plants the period is more or less extended, though frequently does not amount to two years.

"The time when seeds are self-sown is frequently quoted as being the most suitable for propagating the species with the greatest degree of certainty in the absence of cultivation; but this is hardly likely to commend itself for general application, particularly amongst annuals and perennials, if for no other reason than the attendant inconvenience consequent upon the space of time which would frequently elapse before germination. With trees and shrubs the keeping qualities of seeds vary considerably, and these, being cultivated with a different object to plants of herbaceous nature, should, as a general rule, be planted at the earliest opportunity after ripening. Those of many of our cultivated fruits will not remain fertile for any length of time, and commence to germinate almost immediately after, and, in some cases, previous to planting. The germination of others, though possessing keeping qualities, is greatly accelerated by immediate planting. The conditions under which seeds are stored must affect their vitality, as the external agents essential to vegetation are water, heat, and air.

"The principle of seed-sowing is never to bury the seeds deeper than is indispensable to the preservation of moisture around them, and it is generally accepted that they should be planted beneath the surface about the same depth as the extent of their own diameter, and those of a very delicate nature immediately on the surface, provision being made for the supply of the necessary moisture by capillary attraction. The covering with earth is to be regarded mainly as a method of preserving around them the necessary moisture rather than, as frequently supposed, as a means of guarding them from light, for, if deposited on a damp soil and covered with a plate of glass closely pressed down upon them, they will germinate as well as if in darkness. Seeing that the preservation of moisture (which, except in rare instances, must not be excessive) is one of the main factors in stimulating germination, it is indispensable that the top soil at least is of a constituency best calculated to maintain a moist but not sodden condition. Fine, light, and rich soil, or a compost containing peat and leaf-mould, is considered most favourable to the growth of nearly all seeds, though it is advisable, particularly where it is proposed to transplant the seedlings, that the fertility be not too intense, or an over-luxuriant growth, and consequently instability, will result.

"Though seeds will germinate with due supplies of heat and moisture, a fertile soil is essential to further progress, and it is found from experience that seeds of some plants do not vegetate in a strong loam, though the plants afterwards flourish in soil of that description. Experiments have been made on the vegetation and growth of plants in pure earths, and also in these with the aids of stimulants and manures. It might have been supposed that the pure earths, with the addition of artificial manures, would have answered as well as a compost of peat and loam, but the result proved quite the contrary. A moderately fertile and open soil will give best results, and tend to sturdy growth and general fitness of the young plants to withstand transplanting, though the effects of light and watering must be considered in this connection.

"For starting annuals and perennials for transplanting, except those of a very delicate nature (where pots or seed pans had, perhaps, better be employed), shallow boxes, with a suitable shade or covering to prevent damage by heavy rains, and also as a protection against the sun's rays, are satisfactorily utilised. There is some diversity of opinion as to whether seeds should be planted in a damp soil, a comparatively dry soil and watered immediately after planting, or allowed to absorb moisture from the surrounding soil for a varying time, according to the nature of the seeds, before watering. With such as are under close supervision this would not appear to be of much importance. With field crops, more particularly those bearing small seeds, planting in comparatively dry ground has its advantages, for the seed has, under ordinary circumstances, filled out through the agency of moisture by absorption, and bursts almost immediately on the application of greater supply, the young root,

or radicle, being pushed downward to a sufficient depth to maintain that necessary for future development. If planted in moist soil shortly after rain, germination is stimulated, but slower in action, and, in the absence of further rain, the drying of the surface soil may be so rapid that the young plants perish through the inability of the radicle to penetrate the soil to a sufficient depth in time to meet the requirements.

"The effects of light and shade are very pronounced on young plants. Just how much shade is required can only be gauged by observation and experience. The effects of the direct sun's rays on those of a delicate nature would be disastrous, whilst the absence of sufficient light would cause a weak and drawn growth. Overwatering may also have a tendency in the same direction, and before transplanting increased light and less water will tend to harden the young plants, that they may be better able to withstand the shock.

"Insect pests are frequently troublesome at this time of the year, destroying the young plants indiscriminately. Those which inhabit the soil of pots, &c., may be displaced or destroyed by hot water, which, though death to all insects at a temperature of 120 degrees to 125 degrees, does not appear to injure plants. Its application to foliage is unsatisfactory owing to the difficulty of maintaining the temperature, which immediately drops when a spray is made. The vegetable-grower finds his investments in seeds of the Brassica family a dead loss owing to the persistency of small caterpillars that apparently await the appearance of the young plants above ground, and attempts to destroy the pest with insecticides usually result in the destruction of the plant also. Caterpillars which attack plants in this manner are the larvæ of small moths, which are seldom seen in the daytime, and, consequently, escape the blame to which they are entitled. A simple and effective barrier against their inroads may be made by covering a small frame—either for boxes or open ground—with mosquito net, and keeping the plant under cover until they are large enough to transplant, when the liability to damage from the same source will be greatly minimised. The presence of an injurious fungus amongst young seedlings is sometimes noted, and may occasion the loss of the whole stock. It generally makes its appearance where leaf mould or other regretable substance which is not thoroughly decomposed has been used, or where plants are overcrowded and not allowed sufficient light.

"In general, for raising plants from seeds no hard-and-fast rules for detail can be laid down. To obtain the best results the various surrounding circumstances must be taken into consideration, and the general treatment modified accordingly."

HANDY METHOD OF MEASURING GIRTH OF TREES.

Those who have to spend time in taking measurements of the girth or rubber and other trees will find the following method considerably shorten their labours. Take a piece of strong tough paper or highly-glazed calico, 1 or $1\frac{1}{2}$ inch wide, and measure it out into inches and feet. I have found the prepared tracing paper or cloth used in plan-making very good for this purpose. Begin the measurement a little way from the end of the tape, and through the one inch line put a strong large drawing pin, folding the rest of the tape over, and, if necessary, stitching it to keep the flat head of the drawing pin in place. The measuring tape is now ready for use, and if the girth of trees is to be measured the procedure is as follows:—Place the measuring tape round the tree, overlapping it, and press the drawing pin into the tape where it crosses again. This will leave a clean round hole in the tape, the length of which can either be recorded at the time, or else, if an average is required, the tape can be taken home and the number of holes at different distances recorded. The smallness of the diameter of the pin—about $\frac{1}{40}$th of an inch—reduces the possibility of two measurements falling into one hole to a minimum. I have found that even when many hundred readings are taken all the holes can be deciphered.—"Straits' Agricultural Bulletin."

Tropical Industries.

TREES FOR THE TROPICS.

By HOWARD NEWPORT, F.R.H.S., Instructor in Tropical Agriculture and Manager of the Kamerunga State Nursery.

SHADE AND ORNAMENTAL TREE AND SHRUB PLANTING, AND THEIR NECESSARY TREATMENT, IN PUBLIC AND PRIVATE GROUNDS, STREETS, ETC., IN NORTH QUEENSLAND.

It is often a matter of difficulty to committees of various public institutions, mayors, schoolmasters, and private individuals interested, once it has been decided that trees shall be planted, what to choose, where and how to get them, where to put them, and what, if anything, should be done subsequently. Having been in receipt of a number of letters asking for just this information, it is thought that a short article on the subject would be of general interest and utility, especially if coupled with a list embodying a short and not scientifically worded description of some available trees, plants, &c., especially suitable for these purposes in the tropics. The aim of the list is to be suggestive rather than exhaustive, and to give such information as may guide those interested in choosing such trees as may be suited as well to the conditions of their locality as to their ideas of ornament, variety of foliage, or style of growth.

What Sort of Trees to Select.—The sort of soil and the locality—*i.e.*, high exposed situation or low protected one—is, perhaps, the most important point, for however suitable the variety of tree may be for the purpose, if it is not going to adapt itself to its environment and thrive, it is never going to prove of use or ornament. The ordinary average soils of towns are not good from the agricultural or horticultural point of view. Most are hard and gravelly; but trees, fortunately, do not require the tilth or richness of the vegetable garden. Nevertheless, the tree has, if it is to grow any size, soon to send its roots far beyond the pit that may be and generally is dug and filled with good soil for it. So the tree must be selected that is likely to thrive in the hard, gravelly, the rocky, slaty, clayey, or loamy soil, and the subsoil of wash or gravel, of sand, of deep free soil, sheet rock or boulder, as the case may be. Again, the fact as to whether the situation is dry and well drained or inclined to be swampy, whether the situation is high and exposed or low and protected, has a material bearing on the kind of tree that must be obtained. If exposed and likely to be affected by wind, trees, not only of deep tap root and able to maintain their upright position, but such as are in themselves strong-limbed or fibrous, must be chosen. Nothing looks more disastrous after a windy night than to see the streets strewn with broken limbs and trees blown out of the perpendicular. Even trees that are susceptible to the effect of wind, and which turn their branches from it and grow most strongly on the protected side, when in a row down a street, give a very lob-sided appearance to the whole locality. Some of our local towns are built on sandy soils not far from the seashore, and in which water, either brackish or pure, is to be met with at but

a few feet below the surface. In such, disaster is only courted by planting trees, however suitable and beautiful otherwise, that require well-drained situations. Such may grow at first, but as soon as the roots reach the wet ground speedily die out. There are trees, very handsome as shade, that revel in just such situations. Nor need the waste patches about a town be neglected because they are apparently pure dry sand; there are many trees that will grow readily and quickly in apparently dry sand, will find their own moisture, and also quickly aid in the production of grass or in the consolidation of the surface by the binding action of their roots and the dropped leaves, &c.

So for localities such as esplanades or promenades at or near sea-level, or what are called maritime situations, high elevations, or windy sites where a wind break is desired, must trees having special qualities of growth or adaptability to such conditions be chosen before their other qualities, however pretty or desirable, can be considered.

In districts favoured by a heavy rainfall many trees can be grown that will not thrive in the drier inland places. Indeed, in the latter case the choice is often very much restricted, but at the same time some species of trees will thrive there that the heavy rainfall will keep stunted or not permit to grow at all in the richer coastal country.

Next, the tree itself must be thought of; and the advantages and disadvantages of such matters as flowering and non-flowering, those otherwise suitable but which produce fruit, are deciduous and require a periodical collecting of the fallen leaves, or are non-deciduous—trees of drooping habit or upright growth, or which have a large surface root growth, &c.—must be duly weighed. Many trees may be found of combined qualities useful under special conditions. Generally for street planting, unless very large, trees of drooping habit, deciduous, or which bear fruit, are inadvisable. Whether flowering or not is immaterial; but, as a rule, flowering trees are less admired in streets than those of upright growth, fair spread, symmetrical habit, non-deciduous, and evergreen in the tropical countries. Under tropical conditions also more shade is required than in more temperate climes, and larger trees can be used with effect and advantage. Fruiting trees are not advisable for obvious reasons, and one or more rows of trees of a similar species, at any rate, in the one street give the best effect.

For parks, large recreation reserves, esplanades, and public grounds, the trees of drooping habit, of widespread and various foliage, are appropriate whether flowering or not. Large spreading leguminous trees that admit of grass growing under them right up to the trunk are useful here, while essentially flowering trees are, perhaps, most admired round hospitals and schools. Near buildings or masonry, trees with large spreading surface root growth, such as most of the figs, should be avoided, as sooner or later occasioning trouble. Thus it will be seen that it but seldom happens that the streets of a township can be uniformly planted up with one species of tree with success, and in other matters uniformity of species means generally an undesirable monotony that is not artistic or admired.

Obtaining Plants.—Once the special variety of tree or trees is selected, the real work of the committee or individual begins. For the extreme North such trees or plants as have been proved to be adapted to the tropical conditions and have been propagated there are not only more satisfactory but cost less in freight to obtain, and less risk is run of loss during transit. If the particulars given in the list against each species do not seem adequate, or any doubt is felt, it would be advisable to send notes of the particulars described above to the official through whom the plants are obtained, and who will supply the information or advice required. When ordering, it is always advisable to

make all arrangements for the transit and receipt of the plants, and at the same time state whether arrangements have been made for planting out promptly on arrival. Plants, however hardy or sturdy in the nursery bed, cannot but suffer if kept for a week or ten days awaiting replanting.

Pits for Trees.—As soon as the plants are expected, therefore, it behoves the committee to see about pits for them. Pits are always advisable even in sandy loose soils. For trees these should be 2 to 3 feet wide at least, by 18 inches to 2 feet deep. After digging, it is best to leave them open for a week or so—if possible, until after a shower of rain. Should any large stones or rocks appear, especially immediately beneath where the plant is to be, they should be removed. In refilling pits, unless the soil is passably good, a barrow full or two of soil known to be good should be added to give the plant a good start. This soil should be carefully mixed with the soil taken out, and the pit filled to surface level, or a very little higher, to allow for subsidence. Pits should not be *filled* with new rich soil, for then the tree grows too quickly to begin with, and is not strong or hardy enough subsequently to fight its own way in the natural soil when it has got beyond the artificial ground. Sometimes trees will in this manner become so soft that they are unable to obtain any nourishment after that of the pit they started in is exhausted, especially if manure is used, and they die. Such generally attract attention by rapid growth at first, and subsequently the variety of plant, or climate, or anything except the method, is blamed for its want of success. A little manure may be used to mix in with soils if desired, but is not necessary. Much manure is bad. Manure (well-rotted stable) is far more successfully applied to the surface and dug lightly in later on when the tree is one to three or four years old—in fact, as a welcome assistance when it is fighting its way down to establish itself in perhaps an uncongenial subsoil.

Guards for Trees.—The next matter is the tree guards. If a tree is worth planting, it is worth guarding. If merely a congenial change of fodder for goats and stray cattle is contemplated, cheaper methods than that of planting trees could no doubt be devised with a little thought. The guards should, therefore, be high enough—at least 4 feet—strong enough to withstand cattle, and wide enough to admit of persons getting inside to weed, &c., to really guard the plant against the evils threatening it. In making guards, to arrange for a panel easily removed or even for a small gate which can be securely fastened costs generally but little more and is well worth while.

Planting Trees.—All the pits for the one planting should, if possible, be filled in and ready on arrival of the plants. The last plant put in after it has been hawked round on a hot day by the man filling in and planting as he goes has naturally but a poor chance compared with the first put in. In planting, each plant should be held by the stem while the roots are opened out, and if crooked bent straight, for in packing the roots are almost sure to become folded in and the earth to have fallen away from them. The roots will probably have been pruned back sufficiently by the sender, and had, therefore, better not be touched with the knife again. A hole of the necessary size having been scooped out of the newly filled in earth in the middle of the pit, the plant should be held in position while the soil is gently returned. Care must then be taken to press the earth firmly with the hand, below each layer of roots in turn, towards the tap or main root; and, finally, to press the soil in level with the surface with the hands and not with the feet. A common mistake is in the idea that the plant is being given a better chance when deeply planted. This is a fallacy that only experience will eradicate, but, as a matter of fact, more plants are killed by too deep planting than by almost any other means. Care should be taken in setting the plant, therefore, to see that it is no deeper in the ground than it was previously, and which can be seen by the colour of the bark on the stem.

SISAL FIBRE.

Following are the concluding remarks of a special report by Commissioner F. H. Watkins "Upon the Caicos Islands, with special reference to the further development of the Sisal Industry," dated June last, which we take from the "Tropical Agriculturist," Ceylon. These remarks are of special interest to Queensland sisal planters; particularly should they note paragraphs 3 and 4, under the head of "Advantages."

GENERAL CONCLUSIONS.

Before embarking on any industry it is well to study carefully all the circumstances connected therewith, and to weigh the probable chances of success or failure. In the sisal industry there exist three essential conditions necessary to arrive at profitable results, namely:—

(1.) Capital, on account of the somewhat expensive machinery for extracting the fibre, and the length of time which must elapse before a return is made for the expenditure of several years.

(2.) A large area of land, especially where the soil is poor, to maintain the cultivation in regular succession.

(3.) An abundant and cheap supply of labour.

The last two conditions can be fulfilled in the Caicos Islands; capital has to be introduced.

It may not be out of place to consider briefly and summarise what may be regarded as the advantages and disadvantages associated with the industry.

ADVANTAGES.

(1.) Land may be purchased cheaply or obtained at a nominal rent, 4d. per acre, in the Caicos Islands.

(2.) The experience, which, in the initial stages of all undertakings, has to be purchased by inevitable mistakes at considerable cost, is now available.

(3.) It may be thought that, if more fibre is produced in these islands, the prices may fall, but it is improbable that the largest possible output of the Bahamas and of the Caicos Islands would ever be sufficient to exert an appreciable effect on the question of supply and demand in the fibre market. On the contrary, it is important that the export of fibre from the Bahamas and these islands should be increased to justify a separate name (*e.g.*, as Sea Island, in the case of cotton) to distinguish it from that produced in Yucatan. At present, the price of the fibre exported from these islands is, in spite of its superiority, governed largely by that obtained for the inferior qualities made in Mexico.

(4.) The universal usefulness of and the enormous and continuous demand for sisal preclude the possibility of overproduction. In 1905, the total export of sisal from Mexico amounted to 597,289 bales, weighing 212,375,231 lb., of the value of 90,625,430 dollars (Mexican).

(5.) When once the industry is firmly established and the initial stages passed, remunerative prices are always obtained for sisal properly extracted and graded. As an index of what returns may be expected, the figures of the last eighteen years, given below, may be instructive:—

(1) Lowest price obtained, 2⅝ cents per lb., equal to £12 5s. per ton.

(2) Highest price obtained, 8½ cents per lb., equal to £39 13s. 4d. per ton.

(3) Average price, 6 cents per lb., equal to £28 per ton.

(4) Present price, 6⅞ cents per lb., equal to £32 1s. 8d. per ton.

A rough estimate of the cost of production, exclusive of purchase or rent of land, machinery, freight, supplies, commission, and interest, but inclusive of local salaries and wages, may be placed at £7 to £10 a ton.

(6.) The unconquerable vitality of the plant and the fact that the fibre, when extracted, does not deteriorate by lengthy storage, are important matters for consideration.

(7.) As it is improbable that the sisal plant would thrive within a "frost-visited" region, the possible area of cultivation is limited, and, as has already been indicated, the plant requires a peculiar soil for its most favourable and profitable growth.

(8.) Looking at the industry from an official standpoint, its development would put to profitable use large tracts of land unsuitable for any other cultivation, and would afford, on a large scale, employment to many who, even now, have oftentimes the alternative between starvation and emigration.

Disadvantages.

(1.) Chief among the drawbacks attached to sisal cultivation is the slow return for the outlay, because four or five years have to elapse after planting before the fibre can be placed on the market.

(2.) The soil suitable for sisal is such as to preclude the possibility of catch and rotation crops, and there are no by-products to aid in meeting the expenditure of the long years in the early stages.

(3.) The isolated life and peculiar conditions of the Caicos Islands are not likely to prove attractive to those desirous of settling and managing their own properties. It is far more satisfactory and economical to place in charge men acquainted with local conditions and the habits and character of the native labourer than to send out as managers men who, however well qualified they may be to supervise machinery, are ignorant of the elements of tropical agriculture. Unaccustomed to the climate, food, and people, the newcomers, although receiving double the salary given to a man born in the place, speedily grow dissatisfied, and the chances of success are hampered by constant changes in the management and by the pet schemes and experiments of each new manager.

SMOKED RUBBER.

DA COSTA'S PATENT RUBBER COAGULATING PLANT.

Whatever may be the differences of opinion between manufacturers as to the value of the different species of crude rubber available in the world's markets, they are certainly unanimous in pronouncing the product of the Pára rubber-tree, as prepared by the natives, to be the best of all species of rubber. The native process of smoking the latex of the *Hevea brasiliensis* (Pára rubber) in the Amazon region is only persisted in because no other process has met with the approval of manufacturers.

Sheet and crêpe rubber were manufactured in Brazil long before the rubber industry was thought of in the East Indies, but it had to be abandoned because of the manufacturers' preference for the native smoked product.

Every chemical ingredient now used in the East Indies to preserve the rubber or assist in the coagulation has been tried again and again, and, in every instance, where the assistance of chemicals has been resorted to, an article of good appearance has been produced, but always inferior to the smoked rubber when tested by the manufacturers' standard. The fact is that any chemical agent, of whatever nature, introduced into the latex of the Pára tree in a liquid or palpable form, injures the resiliency of the rubber produced, as repeated trials have clearly demonstrated.

The real cause of this continues to be one of Nature's mysteries, but it is an undoubted fact. Whilst it is known by long experience on the Brazilian forests that heat will coagulate the latex from the Pára tree, it is also beyond

doubt that fumigation alone will impart to the finished product its lasting properties of resiliency and tensile strength that have made the products of the *Hevea brasiliensis* famous all the world over. So, too, as regards the latex of the *Castilloa elastica* tree, nothing but very fierce heat will kill the enzymes it contains, and unless these are destroyed the rubber produced therefrom will always be jet black and more or less tacky, if kept for any length of time.

On the face of these facts, and because the method of smoking latex by the native process in Brazil is not only very expensive and exceedingly tedious, but also certainly detrimental to the health of the operators, the inventor of this plant thought of devising means of

DOING MECHANICALLY

all that is now done by hand in the rubber forests of Brazil. The Da Costa Patent Coagulating Plant, which is the result of practical experiments and tests, and is now manufactured solely by Messrs. David Bridge and Co., engineers and rubber machinists, Castleton, Manchester, England, for whom Messrs. Zacharias and Co., of Kuala Lumpur, are acting as sole agents in the Malay Peninsula, needs no chemicals of whatsoever nature, so long as tropical forest woods are available for heating the boiler, as well as green foliage of palms of any sort for generating smoke in the boiler furnace. The coagulating and smoking by means of this plant is the simplest of all operations in the rubber industry, and may be performed by any inexperienced hand. The process is as follows:—The latex being brought from the field is strained only, provided it contains mechanical impurities, and is then poured into the coagulating tanks. Steam is meanwhile being raised to about 30 to 35 lb. per square inch in the boiler, forest woods alone being used for this purpose. On the burning wood in the boiler furnace are then thrown green palm leaves, nuts, or any green twigs of tropical trees; the distillation of the woods producing acetic acid, whilst the fumes of the green foliage would be found to contain creosote to some extent. These fumes are accumulated in a special receptacle, after being expunged of all cinders, and are then forced into the coagulating tanks by a steam injector. The force of the steam violently agitates the latex, and during this operation every particle of it is reached by the smoke. In about ten minutes (more if the quantities to be dealt with are large) the whole mass coagulates, and separates from the lyes, and floats in the water caused by the condensation of the steam injected into the tanks. The coagulated substance is allowed to cool off in the tanks, and must afterwards be taken to a small press and blocks, are then reblocked in cube form, and afterwards dried either in a special stove or vacuum dryer. If the first size blocks are only lightly compressed into the form of cubes, they can be easily torn asunder by the manufacturers, and used in their machines without the extra labour of previously cutting them into convenient sizes.

QUALITY OF THE RUBBER PREPARED.

Rubber prepared in this way retains every native element of the resiliency and tensile strength of the native Pára, and will last as long as the wild rubber if kept in a crude state for years.

This coagulating plant has, therefore, not only the advantages of dispensing with the assistance of chemical agents in a liquid form, but also allows the producer to send to the market the only preparation that satisfies all the rubber manufacturers' needs throughout the whole world. In addition to this, it also possesses the unique property of being the only apparatus which can convert the latex of the *Castilloa elastica*, *Funtumia elastica*, &c., into a rubber of equal market value, appearance, and colour to that of the best Pára exported from Brazil.

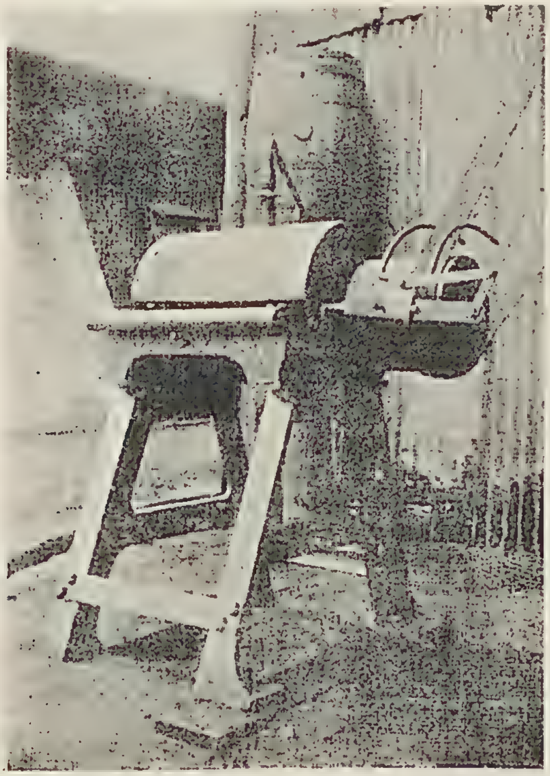
RUBBER MANUFACTURER'S REPORT.

A rubber manufacturer's report regarding smoked rubber produced by Da Costa's Patent Coagulating Plant is as follows:—

Referring to your letter of the 6th of September, *re* special smoked Pára rubber sample, I have pleasure in passing you under separate cover to-day a piece of the rubber washed out from the sample sent, as well as a piece of the prepared vulcanised sheet, 3/16-inch thick, made from the same sample. May be seen at Messrs. Zacharias, Limited, Co.'s office. The mixture, of course, contained no drugs or other material, but just sufficient sulphur for vulcanising purposes. There are also three round samples, 5/16-inch and 3/8-inch and 7/16-inch diameter. There are four samples of vulcanised rubber, and the sample of washed rubber will show up the value and quality of the rubber. I am very pleased with the rubber, and must say it has worked out better than I really expected, and I consider the smoked rubber worth anything from 4s. 6d. to 5s. 6d. per lb.; there is, however, an excess of moisture over and above the best Pára.—"Malay Mail," 23rd December.

A NEW MACHINE FOR SCUTCHING SISAL LEAVES.

The quarterly magazine of the Madras Agri-Horticultural Society, for the quarter ended 30th September, 1907, contains the following description of a machine for decorticating agave fibre, of which the superintendent, Mr. B. F. Cavanagh, says that it combines the qualifications of cheapness, simplicity of structure, and a fair out-turn of clean fibre.



The machine is made by Messrs. Oakes and Co., Beehive Foundry, Madras, who state that it receives two leaves at a time, will decorticate 6,500 lb. of aloe (*sic*) leaves in a day of ten hours, yielding from 3 to 4 per cent. of clean fibre, according to the species of leaf used; another 1½ to 2 per cent. of fibre can be recovered from the waste.*

* This means that the machine will turn out from 195 lb. to 260 lb. of clean fibre per day of ten hours; value, from £3 to £4.—Ed. "Q.A.J."

Mr. L. E. Kirwan, hon. secretary of the society, writes:—

The machine can be driven by a hand gear by coolies, by a bullock gear, or preferably by a $1\frac{1}{2}$-h.p. oil engine. Through the courtesy of Mr. Bryant, the manager of Messrs. Oakes and Co.'s Beehive Foundry, Mr. M. E. Couchman, the Director of Agriculture in Madras, the hon. secretary and myself witnessed a practical test with one of these machines, which was, on the whole, satisfactory. Mr. Bryant expressed the opinion that the machine could easily be made portable by bolting the frame to a strong trolley, but as to this some doubt was expressed. No doubt on good metalled roads this might be done, but there would be great difficulty in transporting such a machine over roads which are in many cases mere cart tracks. Compared with such machines as the "Todd," which is considered one of the best, it has, however, certain material advantages.

1st.—Its cost is only 375 rupees, and four machines can, it is said, turn out as much work as one Todd machine, which would, in Madras, cost about 10,000 rupees.

2nd.—These machines, capable as they are of being worked by coolie or bullock power, could be arranged at convenient sites in the estate, and thus minimise the expense of carting the leaves over great distances.

3rd.—Manual labour being cheap and plentiful, it would save the cost of an engine.

The mechanism of the machine is simple, a great factor in its favour. It consists of an iron frame on four strong iron supports, which can be made fixtures in the ground, or, as before stated, riveted to a trolly. The revolving drum, which is the beater, has raised bars across its length at intervals of a few inches. On the front plate the scraper is fixed; this, by means of two bolts, may be adjusted to take any thickness of leaf. There is also a strong spring at the back of this scraper, which prevents the leaf jamming, and also prevents the fibre from being destroyed by too great pressure.

The photograph shows only the machine. A driving belt can easily be attached to a large fly-wheel to be worked by coolies, who are said to be able to get up a speed of from 400 to 500 revolutions per minute. With a $1\frac{1}{2}$-h.p. oil engine, however, the speed can be increased to 800 revolutions, thus ensuring quicker and cleaner work.

Ten leaves of the *Agave rigida*, var. *sisalana*, of an average length of 4 feet, and weighing 15 lb., were passed through the machine, and the fibre carefully collected and dried. This test resulted in 8 oz. of clean fibre, equivalent to 3·32 per cent.; the waste, it was calculated, would show the leaves as containing almost 6 per cent. of fibre.

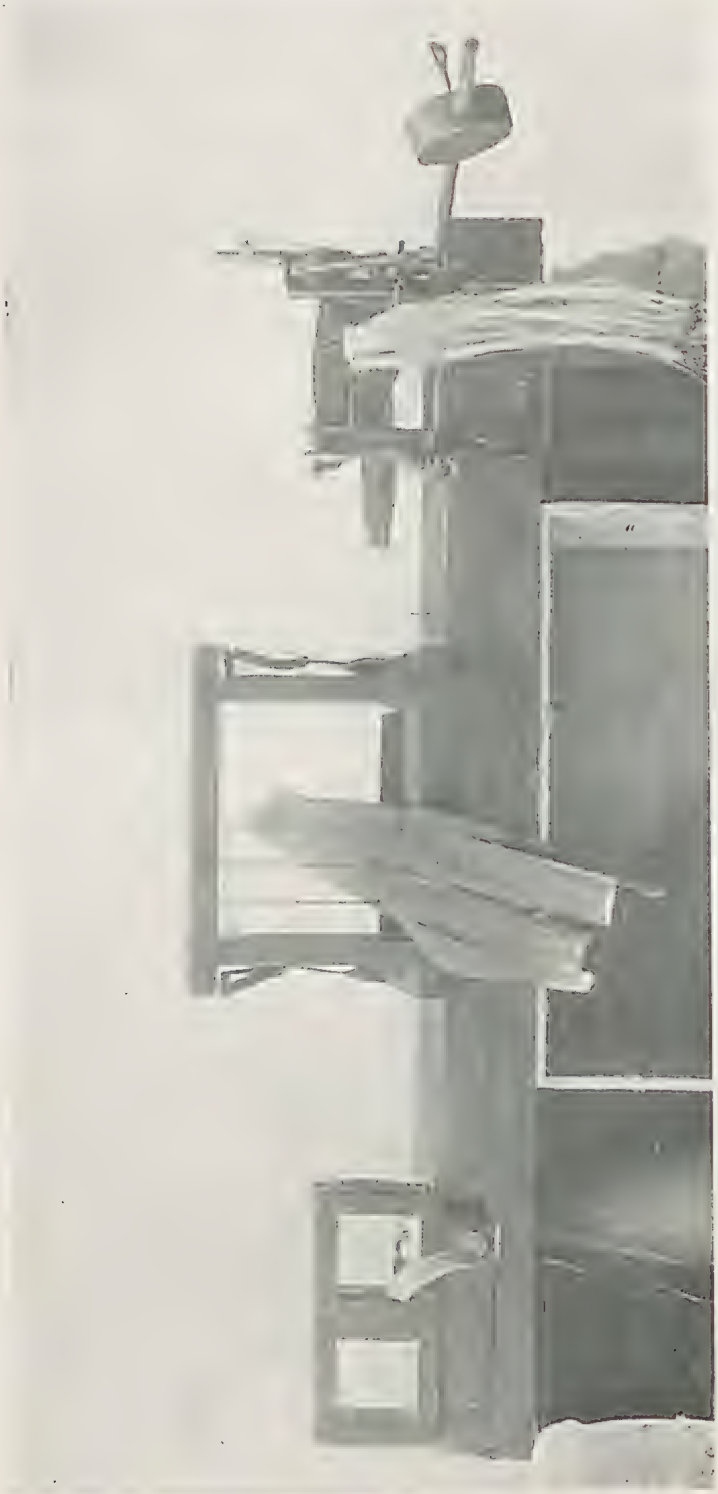
The fibre, after being passed through water after leaving the machine, was white, with a good lustre, and did not appear to have been weakened in any way.

Mr. Couchman in his remarks said:—"The result of this trial—viz., the extraction of 3·75 per cent. of good fibre—is very good indeed, and these leaves appear to have actually contained nearly 6 per cent. of fibre, which is extraordinary."

The results of these experiments were communicated to Mr. J. C. Large, of the Cascades, Yercaud, who has been working a machine of a similar type experimentally. He wrote as follows:—

"The machines should be run at a speed of 800 to 1,000 revolutions a minute. I found here that that is the best speed to obtain good results, as I have one of the same kind, only not so wide. I wish you would try a few leaves of a given weight right through the machine and the fibre snatched from under, and compare the results with those that are drawn back and reversed. Hold the leaf by the tip end. I am convinced that that is the only way to prevent the enormous waste. What they really want is a double pair of revolving rollers in front of the drum—a larger pair to crush the leaf, and the smaller pair to grip the leaf and gradually let it through to the beating drum—when

Plate XXI.



The Duchemin Banana Fibre Extractor.

the end would be cleaned, and the fibre would be snatched away from the bottom. There would then be comparatively little waste, and all the time wasted in drawing back the fibre would be saved. The roller, of course, must revolve at a much lower speed than the drum. You should time the work to ascertain the output of green leaf and fibre. My small machine, at which only one coolie can work, will do at the rate of 5,500 lb. of leaf in ten hours; theirs, which is double the width, and at which two men can work, should do double this. I do not think their plan of doing 6 inches of the tip first will answer, as many of the fibres will slip away when the butt-end is finished. The fibres all start from the butt end, and many of them end before the tip is reached. Your out-turn of nearly 8 oz. fibre from 15½ lb. of leaves equals 3·32 per cent., whilst mine, of nearly 1¼ oz., or say 1⅛ oz., from 1½ lb. leaf going right through, gives 4·67 per cent., which shows an enormous saving.

THE DUCHEMIN MACHINE FOR THE EXTRACTION OF BANANA FIBRE.

We have frequently pointed out the great loss suffered by banana-planters owing to the want of a machine for the extraction of the valuable fibre contained in the stems. Thousands of stems are every week cut down after the bunch of fruit has been removed. Every four of these stems contains enough fibre to make three rice sacks. The fibre is not contained in the whole of each sheath of fleshy layer, but only in the external part of each sheath. A well-grown banana stem is composed of about twenty-one layers or sheaths, 8 feet long. These layers may be divided into 155 ribbons, ⅕-inch wide, and will yield 5,000 feet of fibre. Since it requires 5,850 feet of fibre to make a rice or corn sack, it follows that, as stated above, four stems will suffice to make three sacks.

The apparatus here depicted was invented and patented by Mr. Eugene Duchemin, Paris, and, although it is a hand machine, it far surpasses in speed of work any contrivance yet devised for the extraction of banana fibre in the Philippines. It consists of a cutter with three or more vertical steel blades, through which the sheath is drawn, and is divided into strips of about an inch in width. When this operation is completed, the strips are passed through what is called the "depulper," which is merely a vertical knife fixed in a frame in such a manner that when the strip is passed through it edgeways the useless, fibreless pulp is removed, and the remaining outside part is then easily drawn through the final machine, which leaves the fibre perfectly clean.

An installation of the machine with its accessories includes three fibre-extractors, one triple-cutter, and one pulper. For Sansiviera and sisal leaves a small crushing machine is supplied, something like a miniature mangle with steel fluted rollers.

The price of the four portions of the installation is—pulper, 5s.; cutter, 13s. 4d.; fibre-extractor, £1 5s. As three of the latter machines are required, the total cost in France is £4 13s. 4d., or, with the crushing accessory (£1 8s. 4d.), £6 1s. 8d. To this has to be added, freight, duty, &c., which brings the total cost to between £7 and £8, or, including the crusher, £9 10s. to £10. One boy is needed to cut up the banana stems, another to pass them through the cutters, and a man for each fibre-extractor. Each man can, when used to the work, turn out from 60 to 70 lb. weight of clean fibre in a day. The machine would be of very great value at mission stations, where aborigines and kanakas are taught agriculture or trades. To the Chinese banana-growers, and especially to the Chinese labourers in the banana groves in the Far North, who only earn from 8s. to 10s. per week, the machine would be a boon, seeing that 60 lb. of good banana fibre is worth 13s. 4d., taking the market price of fibre at £25 per ton.

The agent for the machines is Mr. A. Robinson, Civil Service Stores. He has lent a machine to the Editor of this Journal. We have tried it, and,

notwithstanding inexperience in manipulating it, we succeeded in obtaining bright silvery fibre from an old banana stem which had been lying on the ground for several weeks.

It must be borne in mind that the machine is only calculated to add to the family income, by members of the family working in spare time or in wet weather. It is, therefore, admirably suited for districts like the Johnstone River and others where there is a long-continued heavy rainfall. The mission stations, both in Queensland, New Guinea, and the South Sea Islands, could also benefit largely by its use.

RETTING SISAL LEAVES IN SALT WATER.

In the issue of the "Queensland Agricultural Journal" for November, 1907, we mentioned that Mr. F. Main, who favourably criticised the two Queensland pamphlets on sisal culture in the "Journal d'Horticulture Tropicale," stated that he would like to have one very important point cleared up. The point was, whether fresh water is absolutely necessary for washing the fibre, or whether salt water would answer the same purpose. We have made the experiment, and the results were not satisfactory. The application of salt water to the fibre tended to dull the bright silvery sheen, and give it a harsh feel. When the leaves were retted in salt water—a lengthy process, extending over two months—the fibre lost its brilliant colour, and, when dried, was of a dull yellowish hue, whilst it felt harsh and rough to the touch. As far as strength was concerned, the fibre appeared to have gained instead of lost. Still, the loss of brightness by the use of salt water would no doubt have a considerable effect on the market price.

CAICOS ISLANDS' SISAL INDUSTRY.

LARGE AND CERTAIN PROFITS.

In more than one of our colonies in the West Indies the sisal hemp industry is an attractive field for investment, but particularly is this the case in the Caicos Islands, and a special report on the subject has just been published by the Colonial Office. The Commissioner of the Turks and Caicos Islands, who has prepared the report, says that two of the three essential conditions for the profitable cultivation of the fibre can be fulfilled in the Caicos Islands—viz., a large area of land and an abundant supply of cheap labour. What is missing is capital. The industry has been firmly established, on a limited scale, in the islands during the past eighteen years. The price of the fibre during this period has averaged £28 per ton, and the present price is £32 1s. 8d. per ton. The cost of production is roughly estimated at £7 to £10 per ton. This includes local salaries and wages, but not purchase or rent of land, machinery, freight, supplies, and commission. Land, however, is cheap in the Caicos Islands, and can be rented at 4d. per acre. With a larger output the Caicos fibre might make a name for itself (as Sea Island cotton has done), whereas now its price is largely governed by that obtained for the inferior qualities made in Mexico. Other advantages of this cultivation are named, as follows:—

The unconquerable vitality of the plant, and the fact that the fibre, when extracted, does not deteriorate by lengthy storage, are important matters for consideration.

As it is improbable that the sisal plant would thrive within a frost-visited region, the possible area of cultivation is limited, and, as has already been indicated, the plant requires a peculiar soil for its most favourable and profitable growth.

Looking at the industry from an official standpoint, its development would put to profitable use large tracts of land unsuitable for any other cultivation, and would afford, on a large scale, employment to many who, even now, have oftentimes the alternative between starvation and emigration.

The labourers on the existing plantations seem to relish their employment, and give no trouble. In former times the inhabitants supplemented the produce of the soil by what they could obtain "in the way of salvage or otherwise" from the numerous wrecks which occurred thereabouts. A lighthouse has reduced the number of wrecks to a minimum, but Mr. F. H. Watkins, the Commissioner, says that the occasional cry of "wreck" still appeals to many ears with equal force as the word "rats" to a terrier. The local drawbacks to the cultivation of sisal are the same as elsewhere: A delay of four or five years in return of outlay, and the impossibility of catch or rotation crops; but, nevertheless, "large and certain profits" are assured to sisal cultivators.—"Commercial Intelligence."

THE PAPELILLO: A NEW RUBBER PRODUCER.

The "Papelillo," writes the Belgian Legation at Mexico, is a tree belonging to the Euphorbiacea family, originating from Michoacan, the scientific name of which is *Euphorbia elastica.* Messrs. Altamirano and Rose call it "palo amarillo." The tree and its fruit can both be turned to good account. The fruit contains no latex, but yields an oil possessing various purgative and siccative qualities, rendering it suitable for the manufacture of varnish and soap, &c. So far no attempt has been made to use the fruit.

The tree itself is said to be a veritable rubber producer, the latex giving an admirable result, both on the score of quantity and quality. The rubber obtained lends itself admirably to vulcanisation, and is quite up to the standard of the product obtained from the *Castilloa elastica*, the rubber tree *par excellence.* Each tree produces about 6 lb. of latex per annum; it is secured by cutting oblique incisions in the trunk, which heal up in about three months.

The "Papelillo" grows best in a warm climate, and is found in abundance in hilly volcanic lands; it attains a height of 8 metres, and can be easily grown from cuttings.

The tree is ready for tapping in from three to five years after planting; it will yield latex regularly for a period of ten years. It is calculated that the latex of the "Papelillo" contains from 18 to 20 per cent. of fine rubber, and 40 per cent. of resin or gum similar to Gum Damar, and suitable for making varnish.

In these days of tyres, waterproof clothing, and insulations, to mention but a few of the rubber-consuming industries, it seems that the "Papelillo" is a tree which demands careful consideration and fuller study.—"Tropical Life."

A NEW FIBRE.

Samples have been received in Washington (says "Garden and Field") of the fibre of a new plant discovered in Brazil, which, according to the United States Consul at Rio de Janiero, may revolutionise the linen industry of the world. Experiments have reached a point where it is stated, without question, that the fibre is a success and that its influence will be felt in the fabric world. The plant is virtually a weed, growing from 12 to 18 feet high in four or five months, resembling in general appearance the hemp. It is hardy, requires no special cultivation, and matures so rapidly that three crops a year can be grown.

The fibre runs generally into three grades, the finest of which corresponds to the best linen, the second to coarse linen, and the third to European hemp. From the fibre of the plant, therefore, come both fine linen and strong rope.

The residue of the plant is suitable for the manufacture of fine writing paper, so that every portion of the plant can be used for some industrial purpose.

The process of producing fibre from the new plant has just been patented in the United States. Whether the plant can be grown in the southern portion of the Pacific Coast regions of America free from frost is not yet known. The subject merits the investigation of the agricultural and industrial authorities.

CIGAR-LEAF IN THE BOWEN DISTRICT.

The illustrations show 2 acres of tobacco being grown by Mr. A. E. J. Emmerson, of Amelia Vale, on the Andromache River, 54 miles from Bowen. Mr. R. S. Nevill writes respecting the soils in this district:—"Here are found large bodies of the finest lands for general agricultural purposes I have seen in the State, and they are especially adapted to tobacco-growing. This district should become the centre of a profitable farming as well as tobacco-growing industry. At present there are only two settlers for many miles."

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

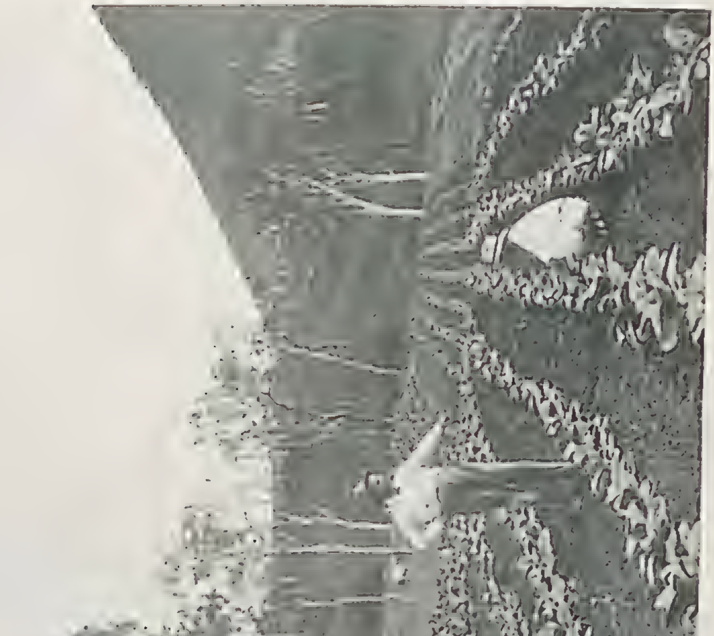
TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1907.										1908.		
	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
North.													
Bowen	1·97	0·39	3·46	2·87	Nil	1·28	0·51	0·06	3·71	6·39	10·14	5·63	9·46
Cairns	3·26	3·35	8·65	4·45	0·12	0·39	1·35	0·68	5·35	28·33	27·02	8·03	20·60
Geraldton	4·58	6·08	21·91	8·54	2·39	4 66	1·36	1·42	6·45	33·82	44·39	13·27	39·00
Herberton	2·05	0·90	1·57	2·71	Nil	0·11	0·12	0·17	3·41	9·57	9·29	5·02	8·92
Hughenden	1·17	0·16	1·34	0 95	1·16	Nil	Nil	1·66	0·66	7·75	0·98	5·18	6·91
Kamerunga State Nurs.	4·87	2·80	9·33	5·29	0·13	1·15	1·19	0·53	2·76	29·82	...	7·47	...
Mackay	8·01	1·58	•6·09	5·04	0·27	0·25	0·12	0·12	5·76	9·70	9·28	3·83	17·43
Rockhampton	3·05	0·44	0·94	4·16	0·84	0·47	Nil	0·47	3·72	4·42	3·84	9·64	9·77
Townsville	7·37	1·03	3·11	2·38	Nil	0·07	0·14	0·03	2·82	24·26	12·21	6·69	9·03
South.													
Biggenden State Farm	10 91	0·34	4·02	5·24	1·51	0·96	0·24	1·99	2·50	5·55	...	9·82	...
Brisbane	5·32	0·45	4·75	2·91	0·39	0·79	0·10	1·37	4·25	3·21	2·80	8·43	18·19
Bundaberg	12·81	0·38	3·08	4·49	0·87	0·43	Nil	1·70	2·90	2·99	4·77	2·82	7·35
Dalby	3·72	0·20	2·26	2·35	0·87	0·71	0·15	0 69	5·18	1·44	0·17	4·88	7·61
Esk	3·60	0·22	5·42	2·66	0·54	0·81	0·57	0·50	3·76	3·72	2·61	10·06	...
Gatton Agric. College	2·71	Nil	2·80	1·85	0·54	0·56	0·15	0·71	3·01	4·55	...	3·38	...
Gindie State Farm ...	10·10	Nil	Nil	2·29	1·58	0·10	0·16	0·61	1·57	4·42	0·20	7·17	...
Gympie	8·93	1·12	3·84	3·77	0·80	0·17	0·47	1·20	3·05	5·49	6·26	11·77	80·8
Ipswich	1·95	0·12	3·43	2·22	0·30	0·43	0·05	0·78	4·45	3·40	1·32	6·63	13·77
Maryborough	10·28	1·25	3·21	6·05	0·64	0·93	0·25	2·74	3·49	5·81	5·62	8·07	11·40
Roma	1·87	0·42	0·27	2·47	1·03	0·42	0·04	1·04	3·70	2·51	0·01	6·38	2·51
Tewantin	11·45	1·87	7·16	7·61	1·48	0·95	0·55	1·05	3·12	7·36	10·42	12·47	...
Warwick	5·71	0·51	1·58	1·27	1·16	1·37	0·01	1·37	3·25	3·13	0·76	4·52	6·65
Westbrook State Farm	5·13	0·02	2·53	2·53	1·04	1·78	Nil	1·08	4·76	3·23	...	...	...
Yandina	...	...	...	...	...	...	...	...	...	...	...	...	16·62

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered approximate only.

GEORGE G. BOND,
Divisional Officer.

Plate XXII.



Mr. A. E. Emmerson's Tobacco Plantation, Amelia Vale, Andromache River, Bowen, N.Q.

Plate XXIII.

CIGAR-LEAF TOBACCO ON MR. A. E. EMMERSON'S TOBACCO PLANTATION, AMELIA VALE, ANDROMACHE RIVER, BOWEN, N.Q.

Science.

MENDEL'S LAW.

In our issue for October, 1907, we published a very interesting address, delivered before the Hawaiian Poultry Association, by Philip L. Weaver, on "Breeding," by laws discovered by Abbot Mendel, an Augustinian monk, of Brunn, in Austria, who conducted extensive experiments with cultivating peas in his monastery. In 1901, De Vries in Holland, Correns in Germany, Tschermak in Austria, and Speelman in America rediscovered the same principles of heredity independently, which are now known as "Mendel's Law."

The "Indian Trade Journal" now publishes a further account of this law under the head of

HEREDITY IN PLANT LIFE.

AN IMPORTANT DISCOVERY.

The scientific world is on the point of giving full recognition to a new, strange, and deep-rooted law, writes W. Beach Thomas in the "Daily Mail"; and it is a satisfaction to know that in a few months some of the most striking of its practical results will be published by a body of English scientists.

The new secret is known as Mendel's law. No one has yet been able to give an abstract description of its root principle or find any formula to express it. But the law seems to touch the ultimate mystery of heredity, and some of its workings may be prophesied with indisputable precision. Briefly, the law is this: When pure stocks or strains are crossed, it is found that a certain list of qualities—of which more are being discovered daily—remain, so to speak, indestructible, and appear uncontaminated in a definite proportion of the offspring of all generations after the first.

A concrete example will best show the practical effect of the law. When the tall variety of sweet pea and the short variety of sweet pea are crossed, the first generation are all tall. Tallness is the "dominant" quality over shortness, which is called "recessive." But in the second generation it is found that just one-quarter are dwarf, and not only are they dwarf, but they will remain pure dwarf, without any reversion, and when crossed with dwarf will never again show sign of tallness. The other three-quarters will be tall, and of these tall again just one-quarter will be pure tall, and never again show signs of dwarfness. The remaining two quarters will be impure, but again when crossed with their like will give both pure talls, pure dwarf, and mongrels in due proportion. So that we find in all grandchildren, so to speak, of pure strains the proportion 1 : 2 : 1 has a mystic application—that is, one-quarter of these grandchildren will be exact or pure reproductions in one quality of their grandmother, one-quarter will be pure reproductions of their grandfather, and two-quarters, though resembling one grandparent, will have latent in them the qualities of both.

THE NEW DARWINISM.

"Mendelism"—a word with which no doubt all shall soon be as glib as we are with "Darwinism" and "evolution"—is both a simple and a complex thing. The law in many of its workings is difficult to trace, and is open to dispute, but it has, as I have said, reached, especially in the hands of the Cambridge biologists, results that are plain and undoubted. The apparent anomalies issuing from the law of heredity that Mendel discovered have baffled both breeders of animals and cultivators of plants for centuries. In regard to animals, the simplest and best known case in common experience is perhaps

that of the blue Andalusian fowl. If the pure black and speckled white varieties be mated together, all the chickens will be "blue Andalusians." But mate two of the blue Andalusians, and it always happens that the chickens are of three sorts—some black, some speckled white, some of the composite colour known as blue Andalusian, and the most inexplicable fact in this family picture of inherited qualities is that both the blacks and the whites, as also half of the descendants of the blue's in the next generation may be called pure bred—that is, in certain definite respects no trace of the cross will again appear in their progeny. This issue, though it has a rather different appearance, is theoretically much the same as in the case of the peas, and proves the existence of a deep-rooted law that will revolutionise the science of developing varieties.

Profitable Varieties of Wheat.

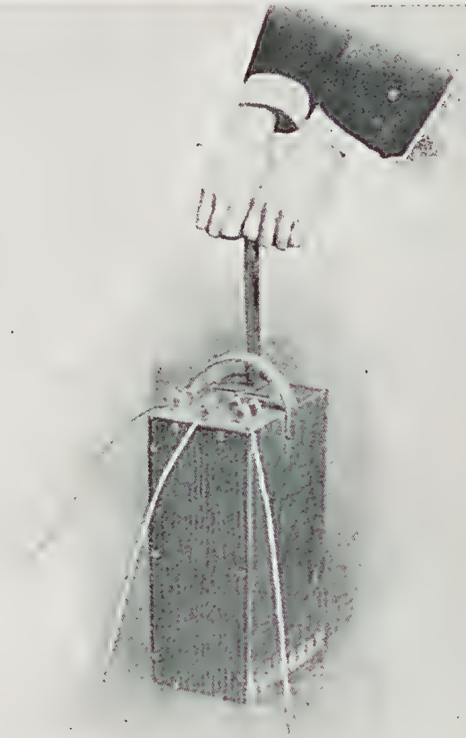
In the Cambridge experiments, wheat has been found to be endowed above other plants with "Mendelian characteristics." The strength of the straw, the length of the ear, the quality of the grain, the resistance to rust—that bane to farmers—all answer to the test. The result is that a man of science can in these respects turn out a new wheat to order within two years, and be quite certain that it will keep true. This has been already done. The great triumph of the Cambridge experiments is to have created a wheat which combines the "strength" of Manitoba hard grain with the yield of the softer English wheats, and it is maintained that already the value of the English wheat crop can be improved by 10s. or more per acre. This is but a foretaste of what can be done. It is expected, for example, that a turnip of vastly increased food value will soon be "fixed." We may presently have a potato with a double percentage of alcohol, and English farmers would thus be able to feed their beasts at reduced cost, and perhaps manufacture out of their own tubers alcohol for driving their own machines and cultivators.

Of course, in the past wonders have been effected by those scientists, known as "the fancy," in getting new varieties of animals and plants, but the work has been done by slow and uncertain methods. Brewers and growers have picked out "sports," or exceptional individuals, and in each generation selected those offspring that had the largest share of the particular virtue required. Some of the successes have been remarkable, if slowly attained; but it has been found almost impossible to know which would breed true; and the pure stocks have often been found miserably delicate. With the help of the new law more wonderful results can be attained within no more than two or three years and with great certainty. Incidentally, the whole conception of what is meant by a pure breed has been altered. The new knowledge will enable the scientific grower to get a pure stock by crossing with stocks once thought impure, and thus give to the new variety at any time that it may be required all the strength of the mongrel without in the least impairing its pure character.

EXTRACTION OF TREE STUMPS BY ELECTRICITY.

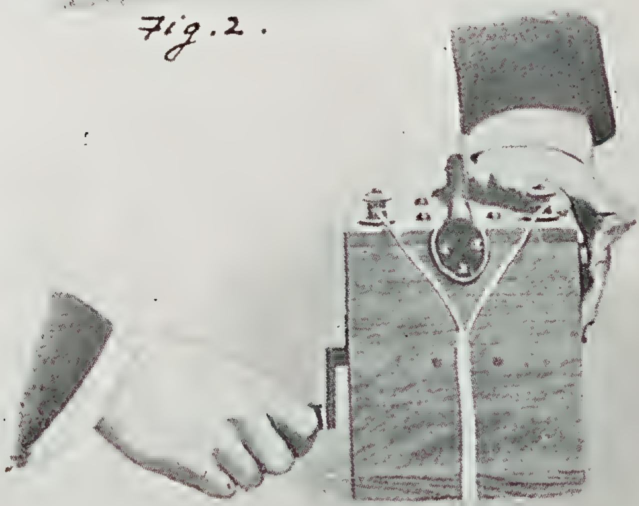
The great expense consequent upon clearing new land and removing the stumps to enable the plough to be used is often beyond the means of many pioneer farmers, and particularly is this the case where heavily timbered forest land has to be dealt with. When scrub land has been felled and burnt off, the majority of the stumps rot out in the course of two or three years, but the hardwoods of the forest land will not rot out for a score of years, and many of them not in half a century. The application of electricity to blasting out stumps has reduced the labour of several hours to a few minutes only. From Messrs. Dalgety and Co. we have received a pamphlet detailing the method of clearing land by electric blasting of the stumps, and showing that little, if any,

Plate XXIV.



[illegible]

Fig. 2.



Method of using "Q" Exploder.

Fig. 1

Method of Using the Exploders.

Plate XXV.

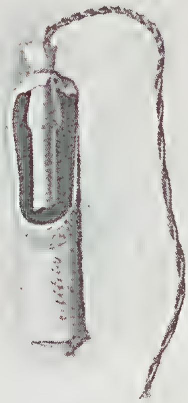


Fig. 3 E. D. Fuse inserted in Cartridge.

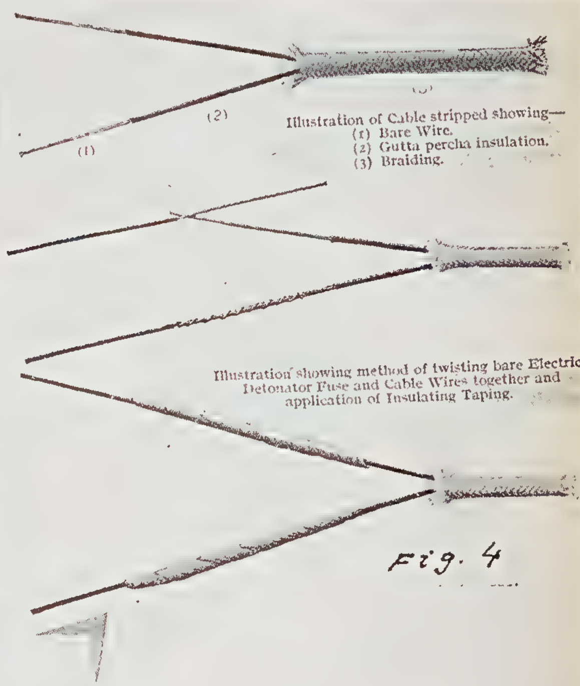


Fig. 4

Fig. 5. Method of using Rackbar Exploder.

Fig. 6 Method of using Q Exploder.

Method of Attaching Wires to the Detonators.

Plate XXVI.

Before Blasting.

The Blast.

After Blasting.

Blasting Standing Timber.

technical knowledge is necessary to carry out the work successfully; and the following instructions show that the process is simplicity itself. A stump is to be extracted. A hole is bored under it with a crowbar till the taproot is reached. Cartridges of blasting gelatine are placed in the hole; a detonator fuse is attached to the upper cartridge. The fuse wire is connected with the cable wire from the exploding machine; the operator retires to a safe distance, touches a firing button, and the stump or tree is torn from the ground. There are two kinds of exploders—viz., the "Rackbar" and the "Q" exploder. In firing with the latter (Fig. 1), grip the exploder firmly with the left hand, and with the right turn the handle rapidly thirty to forty times. When a high speed is attained, press the firing button, but not until this high speed has been got up. Then press the firing button. The same speed must be maintained while the button is being pressed. In firing with the "Rackbar" exploder (Fig. 2), the handle must be pulled up as far as it will come, and then forced down as rapidly as possible. As speed is of prime importance in obtaining the best possible result, both hands should be used to force down the handle till the bottom is sharply struck. Immediately after a shot has been fired, the operator should first disconnect the cable from the exploder and coil it up.

Preparing the Charge.—The cartridges should be of such size as to pass easily into the borehole, which should be $\frac{1}{16}$-inch to $\frac{1}{8}$-inch larger than the diameter of the cartridge, and they should be inserted singly. Press them gently but firmly into the hole with a wooden rammer, one at a time, so as to fill up the hole from side to side. This is very essential.

Adjusting Electric Detonator Fuse.—When the last cartridge (or primer cartridge) comes to be inserted, a hole should be made in it with a small pointed stick, and the detonator, attached to the fuse wire, should be pressed lightly therein, until completely buried in the cartridge. The operator then ties the cartridge-paper tightly over the wires with a piece of twine to prevent the withdrawal of the detonator from the explosive (Fig. 3). The primer cartridge is then gently pressed into the borehole by the wooden rammer or tamping-rod, and brought into contact with the main charge.

Tamping.—When all the necessary cartridges are in direct contact in the borehole, ram in a little clay or damp earth, and then wet it or use mud for filling the entire opening. Loose gravel, sand, stones, &c., are of little service. Use only a wooden tamping-rod.

Connecting Electric Detonator Fuses to Cable.—The ends of the fuse wires and cable wires should be stripped for about 2 inches, and scraped perfectly bright and clean. They should then be carefully joined together by twisting the bare end of the fuse wire tightly round the bare end of the cable wire (Fig. 4).

If the wires of the fuses are not long enough to connect up to each other, use wire from fuses previously used, so long as the insulation is not damaged.

Firing by Aid of Electric Cable and Exploders.—When the charges have all been connected, the free wire of the first hole should be joined to one of the twin main cable wires, and the free wire of the last hole with the remaining wire of the cable (Fig. 5).

The cable should be long enough to enable the operator to reach a place of safety from the blast, or, if no natural or other shelter is available, say, to 80 or 100 yards away.

When ready, and everyone is at a safe distance, connect the cable to each of the projecting screws situated at the top of the exploder, and then screw the nuts firmly down upon the wires. The connection of the cable should not be made until everything is ready for firing, nor until all persons have retired to safety.

The effect of the blast on a large tree is shown on Plate XXVI.

Chemistry.

ANALYSES OF COMMERCIAL FERTILISERS.

TAKEN AND ANALYSED UNDER "*THE FERTILISERS ACT OF* 1905."

Fertiliser.	Where Obtained.	Moisture.	Phosphoric Acid P_2O_5. Water Soluble.	Phosphoric Acid P_2O_5. Citrate Soluble.	Phosphoric Acid P_2O_5. Total.	Potash, K_2O.	Nitrogen, N.	Mechanical Condition. Coarse.	Mechanical Condition. Medium.	Mechanical Condition. Fine.	Remarks.
Simple Fertilisers: Potash Manures.											
		%	%	%	%	%	%	%	%	%	
Chloride of potash	Webster and Co., Ltd., Brisbane ...	...	...	...	...	61·32					
Sulphate of potash	ditto ditto ...	...	...	...	...	51·58					
Kainite	ditto ditto ...	5·81	...	...	...	13·00					
Sulphate of potash (first sample)	Paul and Gray, Limited	·28	...	...	...	52·38					
Sulphate of potash (second sample)	ditto ditto	·74	...	...	...	52·48					
Simple Fertilisers: Nitrogenous Manures.											
Ammonium sulphate ...	Brisbane Gas Company	·93	...	...	...	...	20·77				
Ditto ...	South Brisbane Gas Company ...	1·05	...	...	...	...	20·88				
Sodium nitrate	Webster and Co., Ltd., Brisbane ...	2·62	...	...	...	...	15·42				
Ammonium sulphate ...	ditto ditto ...	1·17	...	...	...	...	20·55				
Bone, Blood, Meatworks Manures.											
Fertiliser	Baynes Bros., Brisbane	4·79	...	...	27·00	...	4·55				
Ditto (second sample) ...	ditto ditto	5·41	...	...	27·55	...	4·80				
Bonedust	Jordan, Zillmere	5·86	...	...	27·60	...	2·69	52	28	20	
Ditto	Queensland Fertiliser Company, Runcorn	6·84	...	...	26·70	...	3·60	58	24	18	
Ditto (second sample)	Jordan, Zillmere	6·30	...	...	27·40	...	3·34	24	64	12	

20

Fertiliser	Central Queensland Meat Export Company, Lake's Creek	5·66	...	...	18·16	...	5·25				
Ditto	Taken by Inspector Williams, Rockhampton	3·97	...	..	23·70	...	3·09	...	...	94	
Ditto	Queensland Meat Export and Agency Co., Ltd., Ross River Works	6·24	...	...	12·86	...	7·02				
Ditto	Jack and Newell, Cairns	7·28	...	...	15·16	...	6·24				
Dried blood	Jordan, Zillmere	10·25	...	...	..	...	12·86				
Bonemeal	Queensland Meat Export and Agency Co., Ltd., Brisbane	8·74	...	...	22·48	...	4·02	43·3	30·4	26·3	
Dried blood	ditto ditto	17·50	...	...	...	...	12·46				
Fertiliser with blood ...	ditto ditto	6·75	...	...	14·28	...	6·38				
Dried blood	Fitzroy Poultry Food Company ...	9·60	...	...	...	...	11·95				

MIXED FERTILISERS, SUPERPHOSPHATES, GUANOS, ETC.

Superphosphate	Webster and Co., Ltd., Brisbane ...	8·40	15·56	...	17·00						
Cereal guano	ditto ditto	11·30	10·15	...	12·36	2·21	3·14				
Root guano	ditto ditto	7·30	10·45	...	12·52	...	·84				
Basic slag	ditto ditto	1·21	...	13·50	18·92	...	...	26	74	...	Sol. in Wagner's ammon. citrate sol.
Shirley's superphosphate (first sample)	Paul and Gray, Limited	2·00	17 24	...	19·51						
Shirley's superphosphate (second sample)	ditto ditto	5·20	18·00	...	20·05						
Shirley's Fertiliser, No. 3 ...	ditto ditto	4·68	12·82	...	15·56	1·99	3·32	...	...	...	Nitrogen as ammonia salts
Ditto No. 5 ...	ditto ditto	5·90	14·29	...	14·53	5·95	3·27	...	...	...	ditto
Ditto (second sample)	ditto ditto	6·00	14·30	...	14·48	6·28	3·24	...	...	...	ditto
Ditto No. 7 ...	ditto ditto	4·91	12·26	...	13·48	3·77	1·80	...	...	...	ditto
Ditto No. 9 ...	ditto ditto	1·68	10·43	...	10·81	3·85	4·17	...	...	...	ditto
Ditto (second sample)	ditto ditto	2·50	9·10	...	10·56	4·15	3·94	...	...	...	ditto
Ditto No. 11 ...	ditto ditto	4·31	12·25	...	13·90	6·15					
Ditto (second sample)	ditto ditto	5·10	11·10	...	12·66	6·10	1·12				
Superphosphate	Millaquin and Yengarie Sugar Co., Bundaberg	13·35	16·25	...	18·70						
Yates soluble plant food ...	Burns, Twigg and Co., Rockhampton	4·13	12·00	...	12·96	6·90	2·89				
Ohlendorff's guano	Gibbs, Bright, and Co., Brisbane ...	3·05	9·50	...	12·91	4·05	6·06				

NOTE.—The samples of manures were taken by inspectors under "*The Fertilisers Act of* 1905," and the results of the analyses show that the composition agrees closely with the guaranteed amounts of the fertilising ingredients—phosphoric acid, nitrogen, and potash.

J. C. BRÜNNICH,
Agricultural Chemist.

General Notes.

TO CURE WESTPHALIA HAMS.

For two of common size, mix 1 lb. of brown sugar, 1 lb. of fine salt, and 1 oz. of pulverised saltpetre. As soon as the hams are cut, rub them with common salt; leave them for two or three days to drain, then wipe them dry; rub them well with the mixture, and put them into deep pickling pans, with the rind downwards. Keep them well covered with the salt and sugar; the third day pour over each ½-pint of vinegar. Leave them in the brine for a month, turning them every day; then dry, and scrape off the salt; rub them with bran, and smoke for four weeks.

A SIMPLE METHOD OF DESTROYING GRASSHOPPERS.

(Translated from the "Tropenpflanzer.")

The "Deutsch-südwestafrikanische Zeitung," writing to the "Cape Times," says that it is possible to poison a swarm of grasshoppers without any danger to cattle, if the work is done carefully. This is proved by an experiment made by Farmer W. M. Hepley, at Vermaaksfontein. The "Burgersdorp Zeitung" makes the following statement on the subject:—

The swarm which the above-named farmer destroyed was a very large one, covering an area 500 yards long and 200 yards wide. They were in the hopping stage, and travelled closely packed together. They had already consumed every green thing on the adjoining farm. A single pound of arsenate of soda sufficed to destroy the whole swarm. The poison was mixed with 4 lb. of brown sugar, and dissolved with hot water in a boiler. Then cold water was added until a quantity of 12 gallons was made up. Six ordinary bundles (about 36 lb.) of green barley were soaked in it for about fifteen or twenty minutes. The barley was not entirely immersed, but each bundle was loosened so that each stalk could fully absorb some of the liquid, of which about one-third was absorbed by the barley. By waving flags the swarm was brought to a standstill close to the boundary of the farm. Then the barley was thinly scattered both in front of and among the grasshoppers, in the following manner: Single haulms were scattered in thin rows over the swarm, each stalk in a row at a distance of about 4 feet from the other, and each row of stalks 10 yards from the next row. In front the stalks were laid thicker. In this manner the barley was distributed over the major portion of the swarm. The rear of the swarm was not interfered with, as there was not sufficient barley. This was, however, of no consequence, as later on the grasshoppers closed up towards the front, and so were enabled to reach the poisoned bait.

As soon as the poison had spread amongst the swarm they came to a sudden halt. This was a remarkable and astonishing effect. Other farmers who had employed the same means of destruction had observed the same thing. Mr. Hepley confessed that he had had his doubts about this result until he saw himself that the whole swarm stopped, and that in the most unexpected manner, on his own farm as soon as the poisoned barley was scattered amongst them. There was no need for further flag-waving, as the grasshoppers no longer showed any desire to spread over the field. The creatures attacked the barley with avidity. Every stalk was covered with hundreds of grasshoppers, which were all poisoned. Before sunset numbers of the insects appeared sick, but so far none had died.

About 8 gallons of the poisoned fluid was left over. This was used in the following manner: In the evening a number of grasshoppers, where they were thickest, were killed by blows from bushes. The bushes were steeped in the poison, and thus the hoppers were plentifully sprinkled with it. On the same evening the remains of the poisoned barley were carefully collected and burnt.

Next morning about one-third of the hoppers were dead, and the survivors were busy devouring them. No more poison was needed. Thenceforward the destruction proceeded automatically. In four days the whole swarm was annihilated. It is remarkable that birds which for two days had fed on the dead hoppers did not seem any the worse for it. The work was very easy, Mr. Hepley, his son, and two natives having been employed only two hours over the business. From the moment the poison was strewed over the swarm they made no attempt during the four days to move on.

ROYAL AGRICULTURAL SOCIETY'S SHOW, TOOWOOMBA.

The Westbrook State Farm will have a very fine exhibit at the above society's show on 4th, 5th, 6th, and 7th August. Considering the splendid season we have experienced, and are likely to experience, between this and August, the State Farm should be able to make a fine show of general farm and market garden produce.

VALUE OF THE POTATO.

It has been stated by an American doctor that the use of water in which potatoes have been boiled will effectually cure gravel by dissolving the calcareous deposit. The water must be strained, sweetened to taste, and used as a drink for two or three weeks. The same doctor has also declared that the coating of deposit inside a steam boiler may be removed by placing a quantity of raw potatoes in the boiler and letting them boil to pieces. After two or three days, a sandy deposit will be found. When this is washed out, the boiler is perfectly clean. We give this for what it is worth. Perhaps some of our readers will try the latter recipe, and let us know the result.

"QUEENSLAND AGRICULTURAL JOURNAL"—GENERAL INDEX.

The revised index to Vols. I. to XIX. of the Journal may now be obtained at this office. Price: ONE SHILLING.

Answers to Correspondents.

POISONOUS BERRIES.

M. E. H., Bogantungan.—

The seeds and berries you forwarded to us have been referred to the Government Botanist. The large pink seed is the *Canavalia ensiformis*, or Sword Bean, and is edible. The small brown seed is a variety of sword bean, the *Canavalia obtusifolia*. The red berries are the fruit of the *Solanum Seaforthianum*, and are poisonous.

Of the small bean, which grows wild in many coastal districts, Mr. Bailey is of the opinion that it *may* be injurious, but he hesitates to give a decided answer, as eminent authorities are not agreed on its properties. Baron von Mueller, late Government Botanist of Victoria, in his work on "Select Extra-tropical Plants," states that it is decidedly deleterious. On the other hand, Trimen, in his "Flora of Ceylon," published in 1903, states that the seeds are much eaten, when boiled, at Batticaloa and elsewhere. Where such eminent authorities differ so diametrically on this point, we cannot decide whether it is poisonous or not without making an experiment on some worthless animal.

A METAL HARDER THAN THE DIAMOND.

CONSTANT READER, Cairns.—

You should have referred your question to the Mines Department or to the "Government Mining Journal." As we happen, however, to have some information on the question, "Is there any metal harder than a diamond"? we submit the following, which appeared in the "West Australian Mining, Building, and Engineering Journal" (4th April):—

One of the most remarkable of the so-called rare metals is tantalum. It is not attacked by hydrochloric, nitric, or sulphuric acids, aqua regia, or alkaline solutions. It can be drawn into fine wire having a tensile strength greater than soft steel. A red-hot lump of tantalum may be at once hammered into a plate which, on repeated rehammering, becomes as hard as diamond. A diamond-drill running continuously for three days at 5,000 revolutions a minute failed to penetrate such a plate, although it was but 1 millimeter (the $\frac{39}{1,000}$th part of an inch) thick, while the drill was much worn.

THE SEASONS.

FARMER, Dugandan.—

Spring begins on the 22nd September.
Summer begins on the 22nd December (the longest day).
Autumn begins on the 21st March.
Winter begins on the 21st June (the shortest day).

TROUBLE WITH COWS.

E. H. S., Butterfield, Gayndah.—

We have submitted your question to the Veterinary Surgeon to the Department, and he gives the following opinion. As you say that several of the dairymen in your district are in the same dilemma, we give Mr. Dodd's opinion and treatment for their benefit also:—

The fault probably rests with the cows and not with the bulls, and I think there is every probability that the cows are suffering from contagious abortion.

Treatment.

Every cow in the herd should be treated as follows:—

The hips, tail, and the parts down to the bottom of the udder should be washed daily with a solution of corrosive sublimate in water in the proportion of 1 part of corrosive sublimate to 1,000 parts of water (1 in 1,000). The cows that fail to prove in calf should have their passages washed out once daily with a solution of corrosive sublimate, in the proportion of 1 part of corrosive sublimate to 2,000 parts of water, and this treatment should be continued for a week. About 1 quart of solution is sufficient for one injection. Cows that are continually returning to the bull should be similarly treated.

If any cows in the herd are noticed to slip their calves, the calves and their membranes should be immediately burned or buried, and the ground where they have laid should be disinfected with some sheep dip. Such cows should be isolated, and their passages should be washed out as described above for cows failing to prove in calf. Also, all cows in a herd affected with contagious abortion that calve at full time should be so treated for one week.

Do not put to the bull until at least a week has elapsed after the last injection. If at the end of this time there is noticed to be any discharge from the passages, the injections as above should be continued twice weekly until the discharge has ceased.

The bull should have his sheath syringed after every service with a solution of corrosive sublimate, in the proportion of 1 to 2,000 of water.

Corrosive sublimate can be bought in tabloids, 8·75 gr., one of which, dissolved in a quart of water, makes a solution of 1 part of corrosive sublimate to 2,000 parts of water (1 in 2,000).

For giving the injections the operator will require 3 feet of ½-inch rubber tubing, and an enamelled funnel attached to it. The hands of the operator and the tube should first be thoroughly washed with soap and water, and then rinsed in 1 in 1,000 corrosive sublimate solution. The rubber tube should be first oiled, and then passed gently into the passage, and the funnel held a little above the root of the tail. The solution should then be poured into the funnel, when it will gravitate into the passages.

An ordinary rubber Higginson enema syringe is a suitable instrument for washing out the bull's sheath.

The corrosive sublimate solution should be prepared in an enamelled, china, or earthenware vessel, as corrosive sublimate has a chemical action on metal.

All newly-purchased cows should be kept apart from those affected with this disease.

PRESERVATION OF STORED MAIZE.

W. H. R., Yatala.—

1. The application of carbon bi-sulphide suffices.

2. In the case of hermetically-sealed tanks, one application is sufficient. When bags are used, renew every fortnight.

3. It is not safe to use bi-sulphide with maize intended for seed purposes. Salt, in this case, is much safer.

4. The only other chemical we know of which will keep off the weevil is chloride of sodium (common salt). Use 1 oz. of bi-sulphide to 100 lb. of grain. Bags in which salt has been packed will keep off the weevil. Be careful not to allow a light to come near the bi-sulphide, as it is highly explosive.

TO TAN SKINS.

'POSSUM, Caboolture.—

You want us to tell you how to tan 'possum skins. Directions are given in the Journal, Vols. IV., V., and XVIII. Possibly you may not have these Journals; therefore "Possumus" once more as follows:—Over 2 quarts of bran pour 5 or 6 quarts of boiling water, then strain; make about an equal quantity of salt water by putting into water blood warm as much salt as it will dissolve. Mix the bran and salt water, and to each gallon of the mixture, when no more than lukewarm, add 1 oz. of sulphuric acid. Then immerse the skins, stirring them occasionally until tanned. Opossum skins will tan in about 20 minutes, and larger skins in proportion. When tanned, rinse in water and hang out in a shady place. The skins, if dry, should be soaked in water before tanning until they are quite soft, and all flesh and grease cleansed from them.

Times of Sunrise and Sunset at Brisbane, 1908.

DATE.	MAY.		JUNE.		JULY.		AUGUST.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·30	5·0	6·39	5·4	6·30	5·18
2	6·14	5·15	6·31	5·0	6·39	5·4	6·29	5·19
3	6·15	5·15	6·31	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·5	6·28	5·20
5	6·16	5·13	6·32	5·0	6·39	5·5	6·28	5·20
6	6·16	5·12	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·33	4·59	6·39	5·6	6·26	5·21
8	6·17	5·11	6·33	4·59	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·7	6·24	5·22
10	6·18	5·10	6·34	4·59	6 39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·38	5·8	6·22	5·24
13	6·20	5·8	6·36	4·59	6·38	5·8	6·21	5·24
14	6·21	5·7	6·36	4·59	6·38	5·9	6·21	5·25
15	6·21	5·7	6·36	4·59	6·38	5·9	6·20	5·25
16	6 22	5·6	6·37	5·0	6·37	5·10	6·19	5·26
17	6·22	5·6	6·37	5·0	6·37	5·10	6·18	5·26
18	6·23	5·5	6·37	5·0	6·37	5·11	6·17	5·27
19	6·23	5·5	6·37	5·0	6·37	5·11	6·16	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·38	5·1	6·36	5·12	6·14	5·28
22	6·25	5·3	6·38	5·1	6·35	5·13	6·13	5·29
23	6·26	5·3	6·38	5·1	6·35	5·13	6·12	5·29
24	6·26	5·2	6·39	5·1	6·34	5·14	6·11	5·30
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·30
26	6·28	5·1	6·39	5·2	6·34	5·15	6·9	5·31
27	6·28	5·1	6·39	5·2	6·33	5·15	6·8	5·31
28	6·29	5·1	6·39	5·3	6·32	5·16	6·7	5·31
29	6·29	5·1	6·39	5·3	6·32	5·17	6·6	5·32
30	6·30	5·0	6·40	5·3	6·31	5·17	6·5	5·32
31	6·30	5·0	...	...	6·31	5·18	6·4	5·33

PHASES OF THE MOON.

			H.	M.	
1 May	●	New Moon	1	33	a.m.
8 ,,	☾	First Quarter	9	23	p.m.
16 ,,	○	Full Moon	2	32	,,
23 ,,	☽	Last Quarter	10	17	a.m.
30 ,,	●	New Moon	1	14	p.m.
7 June	☾	First Quarter	2	56	p.m.
14 ,,	○	Full Moon	11	55	,,
21 ,,	☽	Last Quarter	3	26	,,
29 ,,	●	New Moon	2	31	a.m.
7 July	☾	First Quarter	6	25	a.m.
14 ,,	○	Full Moon	7	48	,,
20 ,,	☽	Last Quarter	10	2	p.m.
28 ,,	●	New Moon	5	17	,,
5 Aug.	☾	First Quarter	7	40	p.m.
12 ,,	○	Full Moon	2	59	,,
19 ,,	☽	Last Quarter	7	25	a.m.
27 ,,	●	New Moon	8	59	,,

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MARCH. Prices.
Apples (Eating), Imported, per quarter-case	8s. to 10s.
Apples, New England, per packer	...
Apples, Cooking, per cace	8s. to 9s.
Apricots, Local, per packer	...
Bananas, Fiji, per case	...
Bananas, Fiji, per bunch	...
Bananas, Queensland, Sugar, per dozen	2½d.
Bananas, Queensland, Cavendish, per dozen	3d.
Cocoanuts, per dozen	2s. 6d.
Custard Apples, per quarter-case	3s. 6d. to 4s. 3d.
Grapes, per lb.	...
Lemons (Lisbon), per case...	4s. to 6s.
Lemon, rough, per case	...
Mandarins, per case	3s. 6d. to 4s.
Nectarines, per box	...
Oranges, per case	3s. 6d. to 5s. 6d.
Passion Fruit (Local), per quarter-case	5s.
Papaw Apples, per quarter-case	...
Peaches, per quarter-case	...
Persimmons, per case	9s. 6d.
Pears, per quarter-case	6s. to 7s. 6d.
Piemelons, per dozen	2s. 6d.
Pineapples (Queensland), Queen, per dozen	...
Pineapples (Queensland), rough, per dozen	6d. to 4s.
Pineapples (Queensland), smooth, per dozen	1s. 6d. to 8s.
Plums, per quarter-case	...
Quinces, per gin case	...
Rockmelons, Local, per gin case	...
Tomatoes, Local, per box	5s. to 5s. 9d.
Watermelons, Local (large), per dozen	...
Watermelons (medium), per dozen	...
Watermelons (small), per dozen	...
SOUTHERN FRUIT MARKET.	
Bananas, Fiji, per case	14s. 6d. to 15s. 6d.
„ „ per bunch	5s. to 10s.
„ Queensland, per case	12s. 6d. to 13s.
„ „ per bunch...	4s. to 6s. 6d.
Cocoanuts, per bag...	...
„ per dozen	...
Mandarins, Fiji, per double case	17s. 6d.
Oranges, American Navel, per case	...
Oranges, common, choice, per case	...
Oranges, medium, per case	...
Passion Fruit, per quarter-case	6s.
Peaches, Victorian, per box of 7½ dozen	11s.
Peanuts, per lb.	2½d.
Pears, per bushel case	12s. 6d.
Pineapples, Queensland (Queens), per case	5s. to 6s.
Pineapples, Queensland (common), choice, per case	6s. to 7s.
Pineapples, Queensland, medium, per case	4s. to 4s. 6d.
Persimmons, per case	5s. 6d.
Pomegranates, per case	4s. 6d.
Rockmelons, per gin case	4s. 6d.
Tomatoes, per box	5s.

The wharf labourers' strike has, it is stated, disorganised the interstate fruit trade.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL.

Article.		APRIL. Prices.
Bacon, Pineapple	lb.	9½d. to 11d.
Bran	ton	£6 15s. to £7 10s.
Butter, Factory	lb.	10½d.
Chaff, Mixed	ton	£3 to £5
Chaff, Oaten	,,	£6 to £6 5s.
Chaff, Lucerne	,,	£4 15s. to £6
Chaff, Wheaten	,,	£4 10s. to £5 10s.
Cheese	lb.	7½d. to 8d.
Flour	ton	£10 15s. to £11 5s.
Hay, Oaten	,,	£7 10s. to £8
Hay, Lucerne	,,	£4 to £4 15s.
Honey	lb.	3d. to 3½d.
Maize	bush.	3s. 9d. to 4s. 8d.
Oats	,,	3s. 8d. to 4s.
Pollard	ton	£7 5s. to £8
Potatoes	,,	£4 to £9
Potatoes, Sweet	,,	...
Pumpkins	,,	...
Wheat, Milling	bush.	5s.
Wheat, Chick	,,	4s. 9d. to 5s.
Onions	ton	£6 15s. to £7
Hams	lb.	11d. to 1s.
Eggs	doz.	1s. 1d. to 1s. 3d.
Fowls	pair	2s. to 3s. 1d.
Geese	,,	...
Ducks, English	,,	2s. 6d. to 3s.
Ducks, Muscovy	,,	3s. 6d. to 3s. 9d.
Turkeys (Hens)	,,	4s. to 6s.
Turkeys (Gobblers)	,,	6s. to 10s. 6d.

ENOGGERA SALEYARDS.

Animal.	MARCH. Prices.
Bullocks	£8 15s. to £10 12s. 6d.
Cows	£6 10s. to £9.
Merino Wethers	21s.
C.B. ,,	24s. 3d.
Merino Ewes	14s. 3d.
C.B. ,,	21s.
Lambs	14s. 9d.
Pigs (Baconers)	...
,, (Porkers)	...

Orchard Notes for June.

By ALBERT H. BENSON, M.R.A.C.

The Southern Coast Districts.

The notes of last month referring to the care to be taken in the handling and marketing of all kinds of citrus fruits apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but, where slowly-acting manures are to be given, their application should not be later than this month. They should be well mixed with the soil, so that, when the spring comes and the trees start a fresh growth, a certain percentage of plant food will be available for the tree's use. Heavy pruning should be done now whilst the trees are dormant. All large limbs should be cut off close to the main stem, the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay, but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit from the part of the orchard to be so treated. Plough the land well, work the soil down fine, so as to get a good seed bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frost, as frost will strike dirty, weedy ground and injure the pines growing thereon severely, when it will do little, if any, damage where the land is kept perfectly clean: another advantage of cleanliness in cultivation.

Tropical Coast District.

Keep the land well cultivated; plough where necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the spring crop of fruit. This applies not only to oranges and other tree fruits but to bananas and pines as well. A good start in spring means good bunches of bananas and early ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit, but where citrus trees are heavily loaded the pruning should be put off till after the spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

Southern and Central Tablelands.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of straggling top heavy trees; and, second, in the case of trees that are going off in the size and quality of their fruit. Where peaches, apricots, plums, or

nectarines are only making very little new growth, and that weak, so that the fruit produced thereon is small, it is advisable to head the tree hard back, so that it will throw out some vigorous branches in spring that will form a new head for the tree. Apples as well as plums and apricots are sometimes inclined to over-produce fruit spurs, which become long and straggling, and bear a large quantity of small-sized fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect on the quality and size of the fruit produced.

Gather and burn all prunings, and where codlin moth is present in the orchard examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses of loose bark in or under which the larvæ of the month may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following spring. As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects, and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchards or of trees to replace any that may have died or that have been found to be unsuitable to the district may be continued during the month and right on till the end of winter.

Do not prune vines in the Stanthorpe district, as it is advisable to leave the pruning as late as possible, but vine pruning can be done at any time now in the Roma or Central district. Tree pruning can be continued during the month, and the orchard should be kept well worked. Citrus fruits can be marketed. Lemons should be gathered and cured.

Farm and Garden Notes for June.

Field.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence, insect pests will, to a great extent, cease from troubling and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them. The land should now be got ready for millets, sorghum, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month; but, obviously, this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or at the earliest in warm, early districts at the end of July. There is always almost a certainty of frosts more or less severe during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and, consequently, a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or sorting them in hills, lay them on a thick layer of sand. Then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland, the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather til-seed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems. A hand machine for this purpose has just been introduced into Queensland from France, which will turn out 65 lb. of clean fibre in a day of ten hours. The agent for the machines is Mr. A. Robinson, Civil Service Stores, Brisbane, and the price, we are informed, is £7 10s.

Kitchen Garden.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb, it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted, also horse radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes, the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open border if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 inches apart.

Agriculture.

THE LOGAN FARMING AND INDUSTRIAL ASSOCIATION, BEENLEIGH.

REPORT FOR 1907.

The hon. secretary of the above association has kindly supplied us with the following very satisfactory report of the operations of the association for the year 1907:—

FINANCE.

The income was £105, and the expenditure £88, leaving a balance of £17 to credit.

MEMBERS.

The membership was sixty-seven, being an increase of eleven on the previous year; fourteen council meetings were held, the average attendance being eleven members.

MARKET.

Rents received from the South Brisbane Farmers' Market show a decrease of £7. The farmers attending are well satisfied, and sell out in the course of a few hours. It is to be regretted that a larger number do not take advantage of the opportunity thus offered to dispose of their products direct to the consumer. The public give a fair measure of support to the market, and undoubtedly, if more farmers and market gardeners attended, they would find a good demand for their produce.

DISTRICT EXHIBIT.

It was not deemed advisable by my council to forward an exhibit last year to the National Association Show, at Bowen Park; but an effort will be made to be represented at the coming show in August next, and I have no doubt a renewed and enthusiastic interest once aroused will result in a display that will prove a credit to the Logan and Albert districts.

BUTTER FACTORY.

It is matter for congratulation that the butter factory at Kingston, initiated by this association, is proving a success and creditable to the district. During the seven months which it has been working, it has succeeded in making a name for itself, owing to the high-class butter it is turning out—butter which gained the championship for Queensland and the second place in the competition at the late Melbourne Exhibition for the championship of Australia. The factory was opened on the 13th May, 1906. The output for the first month was 10 tons of butter. The cream suppliers numbered 120. During December, the output was 10 tons per week, and cream suppliers totalled 260. It is hoped that the work of co-operation will continue, and that a bacon factory will be established in this district, there being, I believe, an opening for that industry.

STOCK.

The association has succeeded in introducing pure bred bulls into the district, and it is hoped that the results will prove beneficial to the small dairy farmers, in whose interests the matter was taken up. The system of supplying members on liberal terms has proved a success. We trust that the association will receive the measure of support it undoubtedly deserves by drawing new members to itself and in gaining their confidence and support during 1908.

EXPENDITURE AND RETURNS IN CONNECTION WITH IRRIGATION WORK AT QUEENSLAND AGRICULTURAL COLLEGE.

In connection with the following statement, the Principal of the Agricultural College points out that the work was conducted during a dry period, and the crops were harvested when the price of produce was high. The price set againts crops was the market value at the time of reaping. The height to which it was necessary to raise the water, together with the cost of fuel, made the irrigation somewhat expensive.

No engineer was employed in connection with the machinery, except to effect some slight repairs which from time to time became necessary.

I. Crop—Oats. Area—30 acres.

EXPENDITURE.

	£ s. d.	£ s. d.
Application of water—		
1 man, 41¼ days, at 5s.	10 6 3	
4 students, 41¼ days, at 1s. 4d.	11 0 0	
1 horse, 13½ days, at 2s.	1 7 0	
		22 13 3
Cutting and carting firewood—		
2 men, 17 days, at 5s.	8 10 0	
2 students, 17 days, at 1s. 4d.	2 5 4	
2 horses, 17 days, at 2s.	3 8 0	
		14 3 4
Coal—		
15 tons 18 cwt., at 7s. 6d. per ton, f.o.b. ...	5 19 3	
Freight on above, at 5s. 9d. per ton	4 11 5	
Cartage from Gatton, at 3s. per ton	2 7 8	
		12 18 4
Total expenditure		£49 14 11

RETURNS.

	£ s. d.
Green oats, 41 tons 12 cwt., at £1 10s. per ton	62 8 0
Oaten hay, 30 tons, at £6 10s. per ton	195 0 0
Total value of crops	£257 8 0

Net return from irrigation, £207 13s. 1d.

II. Crop—Lucerne. Area—15 acres.

EXPENDITURE.

	£ s. d.	£ s. d.
Application of water—		
1 man, 7¾ days, at 5s.	1 18 9	
4 students, 20½ days, at 1s. 4d.	5 9 4	
1 horse, 9½ days, at 2s.	0 19 0	
		8 7 1
Cutting and carting wood—		
2 men, 8 days, at 5s.	4 0 0	
2 students, 8 days, at 1s. 4d.	1 1 4	
2 horses, 8 days, at 2s.	1 12 0	
		6 13 4
Coal—		
7 tons 5 cwt., at 7s. 6d. per ton, f.o.b.	2 14 4	
Freight on above, at 5s. 9d. per ton	2 1 8	
Cartage from Gatton, at 3s. per ton	1 1 9	
		5 17 9
Total expenditure		£20 18 2

RETURNS.

	£	s.	d.
Green lucerne, 17 tons 5 cwt., at £1 10s. per ton	25	17	6
Lucerne hay, 10 tons at £7 per ton	70	0	0
Total value of crop	£95	17	6

Net return from irrigation, £74 19s. 4d.

Irrigation was commenced at the end of August, 1907, and carried on throughout September, October, and the early part of November.

With reference to the above particulars of the irrigation experiments at the Queensland Agricultural College, Gatton, the Principal of the College, Mr. John Mahon, points out that very few districts in Queensland afford better facilities for an irrigation scheme than the Lockyer. The water of Lockyer Creek, when supplied to the land under properly controlled conditions, has no injurious effect on the soil or the growth of vegetation. There is a natural fall from the banks of the creek on both sides, which means that the cost of distributing the water would not be great. Weirs could be placed in the creek at various distances apart, and thousands of acres irrigated at a small cost. This would be the means of increasing the value of the land by at least 20 per cent.

RESULTS FROM STRIPPING EXPERIMENTS.

By C. F. ECKART,

Director, Division of Agriculture and Chemistry, Honolulu, Hawaii.

In June, 1906, a bulletin (No. 16), entitled "The Influence of Stripping on the Yields of Cane and Sugar," was published by this division of the Experiment Station, and data were presented showing the relative yields obtained from stripped and unstripped cane in three series of experiments. In this bulletin (No. 25) the results from the ratoon crop of the second series of tests are given along with the results derived from the plant crop. This bulletin is, therefore, supplementary to Bulletin No. 16, and considers the yields of cane and sugar from two crops on fourteen plats in the station field.*

The plant cane (Lahaina) was planted in June, 1904, and harvested during the last of February and the 1st of March, 1906. It was stripped three times, as follows:—

1st stripping—25th January, 1905.
2nd ,, 2nd June, 1905.
3rd ,, 1st November, 1905.

The ratoons were cut back in July, 1906, and harvested in January, 1908.

Stripping was performed on the following dates:—

1st stripping—6th March, 1907.
2nd ,, 15th July, 1907.
3rd ,, 20th October, 1907.

Each plat consisted of four rows, 50 feet in length, the two middle rows forming the bases of the comparisons; one of these test rows was stripped, and the other was left unstripped.

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* This Bulletin (16) will be found reprinted in the "Q.A.J.," Vol. XVII., page 237. *See also* "Q.A.J.," Vol. XIX., page 36, on "Stripping Sugar-cane."—Ed. "Q.A.J."

With the exception of Plat No. 1, which was not fertilised, all of the cane received the same mixed fertiliser, divided up into different proportions for the several applications, some of the plats receiving supplementary quantities of nitrate of soda, as was described in Bulletin No. 16, page 6. This explains the variation in the yields from different plats, since the tests were planned to cover both fertilisation and stripping. Owing to the fact that the stripped and unstripped rows in each plat were immediately adjoining, the yields from these rows are comparable, and the average results from the fourteen plats afford positive conclusions with respect to stripping at the experiment station. The fertiliser experiments are inconclusive, and will be repeated on plantation substations in accordance with the system of long, contiguous plats adopted by the division for reasons given in Circular No. 6, page 42.

The following tables show the yields of cane and available sugar, together with the quality of the juices, from stripped and unstripped rows in fourteen plats for two crops of cane:—

WEIGHT OF CANE PER ACRE—TONS.

Plat.	Plant Cane.		Ratoons.		Average.	
	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.
1	93·31	90·52	57·49	71·22	75·40	80·87
2	64·73	88·34	49·09	59·72	56 91	74·03
3	71·09	98·01	48·78	67·69	59·93	82·85
4	91·78	108·33	58·45	65·99	75·11	87·16
5	67·00	111·25	56·27	64·86	61·63	88·05
6	82·55	112·21	64·73	72·04	73·64	92·12
7	73 57	97·88	62·90	62·33	68 23	80·10
8	72·22	99·49	53·97	74·79	63 09	87·14
9	78·10	91·30	63·33	80·89	70·71	86·09
10	76·27	101·93	57·62	74·74	66 94	88·33
11	64·29	97·36	56 32	77·49	60·30	87·42
12	84·16	111·82	70·13	82·15	77·14	96·98
13	67·08	94·09	60·02	81 67	63·55	87·88
14	84 51	108·38	74·61	89·69	79·56	99 03
Average	76·47	100·78	59 55	73·23	68 01	87·00

ANALYSIS OF JUICES.

Plat.	Brix.				Sucrose.				Purity.			
	Plant, 1904-6.		Ratoons, 1906-8.		Plant, 1904-6.		Ratoons, 1906-8.		Plant, 1904-6.		Ratoons, 1906-8.	
	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.
1	21·1	21·1	19·7	20·4	19·1	19·2	17·6	18·5	90·6	90·7	89·3	90·7
2	19·6	20·0	18·6	19 7	18·0	18·3	16·5	17·6	91·7	91·1	88·7	89·3
3	19·2	19·4	18·4	19·4	17·4	17·7	16·4	17·0	90·6	90·9	89·1	87·6
4	19·3	19 8	17·8	18·7	17·4	18·0	15·6	16·3	90·2	90·9	87·6	87·2
5	16·7	19·2	17 8	18·8	14·7	17·3	15·5	16·5	87·6	90·1	87·1	87·8
6	18·8	19·0	17·5	18·4	16·9	17·1	15·2	16·1	89·4	89·7	86·9	87·5
7	17·6	18·5	17·9	18·8	15·4	16·5	15·3	16·4	87·5	88·9	85·5	87·2
8	19 0	18 9	18·1	19·3	16·9	16·9	15·8	17·0	88·6	89·5	87·3	88·1
9	19·5	20·5	18 5	19·2	17 7	18·7	16·4	17·1	90·6	91·0	88·6	89·0
10	19·4	19·6	18·2	19·6	17·4	17·7	16·0	17·4	89·8	90·4	87 9	88·8
11	17·6	19·8	18·6	18·6	15·7	17·8	16·1	16·4	88·7	90·2	86·6	88·2
12	19·4	19·9	18·0	19·0	17·4	18·0	15·3	16·5	89·6	90·3	85·0	86·8
13	17 7	19·3	18·1	18·4	15·6	17·4	15·2	15·9	88·1	90·0	84·0	86·5
14	18·1	19·7	17·7	18·9	15·7	17·8	15·1	16·6	87·1	90·1	85·3	87·8
Averages ...	18·8	19·6	18·2	19·0	16·8	17·7	15·8	16 8	89·3	90·3	87·0	88·0

GLUCOSE AND GUMS OF JUICE, AND FIBRE PER CENT. CANE.

Plat.	GLUCOSE.				GUMS.				FIBRE % CANE.			
	PLANT.		RATOONS.		PLANT.		RATOONS.		PLANT.		RATOONS.	
	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped	Not Stripped.
1	·28	·34	·47	·40	·33	·44	·17	·20	10·1	11·5	10·25	9·25
2	·30	·32	·54	·43	·34	·44	·24	·16	10·5	11·5	10·75	10·98
3	·41	·37	·56	·43	·40	·47	·23	·16	10·3	11·4	11·25	10·00
4	·43	·32	·66	·60	·38	·45	·32	·18	11·1	10 3	10·00	10·50
5	·69	·43	·66	·58	·34	·44	·10	·10	11·5	10·0	11·22	9 25
6	·56	·42	·72	·66	·44	·44	·06	·08	11·0	11·4	10·00	9·00
7	·64	·67	·71	·62	·36	·38	·14	·20	10·0	11·0	10 25	11·00
8	·57	·55	·64	·52	·40	·43	·23	·23	11 6	11·5	10·75	10·00
9	·39	·37	·59	·55	·39	·44	·19	·20	11·4	10·9	10·50	11·43
10	·50	·51	·66	·56	·35	·44	·20	·22	10·3	11 6	10·25	10·00
11	·50	·40	·63	·61	·46	·44	·20	·21	11·7	11·1	9·50	9·75
12	·48	·40	·77	·50	·38	·43	·20	·21	10·4	11·0	9 25	12·50
13	·57	·41	·77	·74	·43	·41	·21	·20	11·1	11·0	10·75	11·00
14	·57	·45	·88	·69	·42	·46	·19	·20	10·5	10·9	11 00	10 5
Averages ...	·49	·42	·66	·56	·38	·43	·19	·18	10·8	11·1	10·40	10·36

WEIGHT OF AVAILABLE SUGAR—TONS.

Plat.	PLANT, 1904-6.		RATOONS, 1906-8.		AVERAGE.	
	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.
1	14·54	14·17	8·19	10·73	11·36	12·45
2	9·55	13·20	6·53	8·51	8·04	10·80
3	10·12	14·17	6·47	9·23	8·29	11·70
4	13·05	15·94	7·31	8·61	10·18	12·27
5	7·90	15·69	6·97	8 59	7 43	12·14
6	11·29	15·59	7·86	9 29	9·57	12·44
7	9 10	13·03	7 63	8·20	8·36	10·61
8	9·84	13·69	6·82	10·22	8·33	11·95
9	11·20	13·95	8·37	11·18	9 78	12·56
10	10·79	14 72	7·40	10·49	9 09	12·60
11	8·14	14·15	7·23	10·22	7·68	12·18
12	11·89	16·43	8·48	10·82	10·18	13·62
13	8·42	13 34	7·16	10·35	7·79	11·84
14	10·66	15·88	8·92	11·95	9·79	13·91
Average	10·46	14·56	7·52	9·88	8·99	12 21

Nothing in the way of an experiment could offer more convincing proof than these figures that stripping causes an enormous loss under such conditions as obtain at the experiment station. In condensed form the data may be presented as follows:—

WEIGHT OF CANE. TONS PER ACRE.

	Stripped.	Not Stripped.
Plant Cane	76·47 ...	100·78
Ratoons	59·55 ...	73·23
Average	68·01 ...	87·00

SUCROSE IN JUICE. PER CENT.

	Stripped.	Not Stripped.
Plant Cane	16·8 ...	17·7
Ratoons	15·8 ...	16·8

PURITY IN JUICE.

	Stripped.	Not Stripped.
Plant Cane	89·3 ...	90·3
Ratoons	87·0 ...	88·0

AVAILABLE SUGAR PER ACRE. TONS.

	Stripped.	Not Stripped.
Plant Cane	10·46 ...	14·56
Ratoons	7·52 ...	9·88
Average	8·99 ...	12·21

The accompanying photograph shows the relative quantities of dead cane from the stripped and unstripped rows. It would appear from the illustration that there were twice as many dead stalks where the cane was stripped than where it was left unstripped, but the difference in the size of the piles is due to some extent to the larger number of large sticks in the stack of stripped rotten cane. Where the cane was not stripped, the dead canes which were found in the rows were chiefly those that had died off when quite small; where the cane was stripped, dead sticks of all sizes were found, from young shoots to stalks which had almost reached maturity. The number of dead canes per acre are given in the following table:—

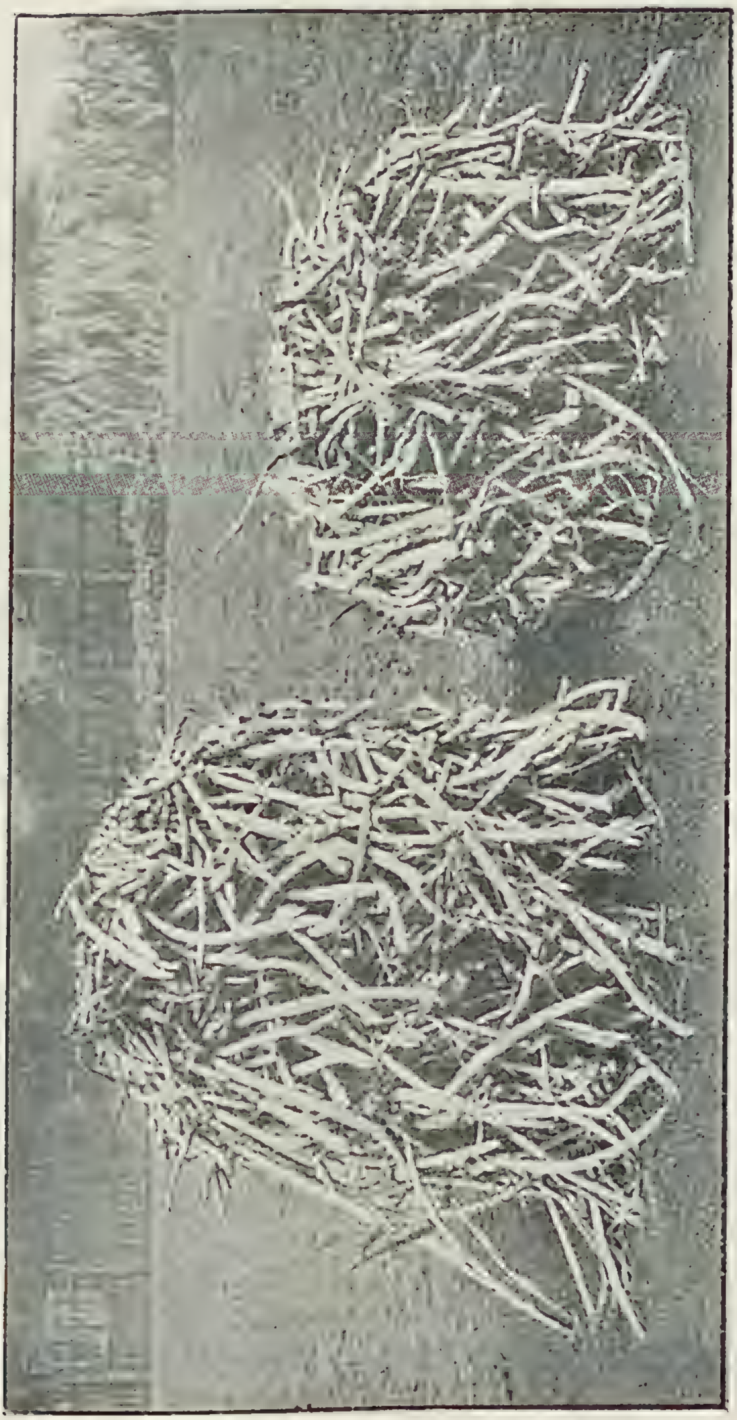
NUMBER OF DEAD CANES PER ACRE.

Plat.	Plant Cane.		Ratoons.		Average.	
	Stripped.	Not Stripped.	Stripped.	Not Stripped.	Stripped.	Not Stripped.
1	2,788	4,530	5,227	4,179	4,007	4,354
2	5,401	4,879	7,492	3,310	6,446	4,094
3	5,750	2,614	9,234	6,795	7,492	4,704
4	5,053	2,265	10,454	4,356	7,753	3,310
5	9,060	3,485	7,492	10,280	8,276	6,882
6	5,227	2,439	8,189	9,583	6,708	6,011
7	8,886	7,144	9,757	9,234	9,321	8,189
8	5,227	3,833	8,015	7,143	6,621	5,488
9	6,098	3,659	9,757	6,795	7,927	5,227
10	7,841	3,833	10,628	9,060	9,234	6,446
11	6,447	5,227	9,757	7,840	8,102	6,533
12	5,924	3,659	7,840	6,446	6,882	5,052
13	9,235	4,879	7,492	5,924	8,363	5,401
14	8,189	3,136	8,015	8,015	8,102	5,575
Average	6,509	3,970	8,525	7,068	7,516	5,519

The data contained in this bulletin, together with that presented in Bulletin No. 16, show clearly the importance of carrying out accurate tests, with respect to stripping, on the plantations. If it should be found that the practice of removing the dead leaves from the cane results, on the average, in a tithe of the percentage of loss which occurs in the experiment station field, the decreased yields from stripping would represent for the Islands an almost incredible figure. Last year on the Island of Oahu alone, approximately 90,158 tons of sugar were obtained from stripped cane. If we could say that the average percentage of loss from stripping for the Island of Oahu was only one-half that at the experiment station, then the loss for last crop would have been approximately 1,210,350 dollars. This figure does not take into consideration the cost of stripping, but is based entirely on the yields of sugar. As far as I am able to learn, 323,800 tons of sugar were obtained from stripped cane on Hawaiian plantations for the crop of 1907. If the average percentage of loss from stripping was one-third of that experienced at the station, this practice cost the plantations in sugar alone, for one year, nearly 3,000,000 dollars.

In carrying out field tests to gauge the economy of stripping in any locality, it is necessary that every possible safeguard to accuracy be observed, and the division would strongly recommend the laying out of experiment areas in accordance with the following plans. These plans call for long, narrow plats. The greater the length of the plats, the more accurate will be the results.

Plate XXVII.



A.

The Pile marked A Shows the Quantity of Dead Canes Taken from 14 Stripped Rows.

B.

That marked B Shows the Dead Canes Taken from 14 Unstripped Rows.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

RECORD OF COWS FOR MONTH OF APRIL, 1908.

Number.	Cow's Name.	Breed.	Date of Calving.	Total Milk.	Average Test, Per cent.	Commercial Butter.	Remarks.
				Lb.		Lb.	
1	Hettie ...	Grade-Shorthorn	26 Mar., 1908	833	4·6	42·91	
2	Rhoda ...	,, ,, ...	31 Mar., ,,	879	3·8	37·41	
3	Carrie ...	Jersey	4 April ,,	709	4·6	36·52	
4	Mona ...	Grade Holstein	26 Oct., 1907	625	4·9	34·30	
5	Glen ...	Shorthorn ..	10 Feb., 1908	683	4·1	31·35	
6	Cocoa ...	Jersey	20 Nov., 1907	569	4·8	30·58	
7	Cuckoo ...	,, ...	4 Mar., 1908	586	4·3	28·22	
8	Winnie ...	Shorthorn ...	15 April ,,	470	5·1	26·85	
9	Ivy ...	Jersey	5 Feb., ,,	519	4·9	28·48	
10	Careless ...	,, ...	29 Oct., 1907	447	5·4	27·03	
11	Honeycomb	Shorthorn ...	23 Aug. ,,	469	5·0	26·26	
12	Laura ...	Ayrshire ...	20 May ,,	502	4·6	25·86	
13	Comet ...	Grade-Holstein	23 Aug. ,,	411	5·5	25·31	
14	Beauty ...	Ayrshire ...	21 Dec. ,,	609	3·7	25·24	
15	Graceful ...	Grade-Shorthorn	8 Jan. ,,	441	5·0	24·69	
16	College Lass	Ayrshire... ...	1 Sept. ,,	473	4·8	24·43	
17	Dora ...	Shorthorn ...	9 Sept. ,,	504	4·2	23·71	Slipped calf.
18	Clare ...	Jersey	21 Aug. ,,	350	6·0	23·52	
19	Poppie ...	Jersey-Ayrshire	24 Feb. ,,	344	6·2	23·75	
20	Damsel ...	Holstein	19 Feb., 1908	640	3·2	22·93	
21	No. 1 ...	Shorthorn ...	2 Dec., 1907	481	4·2	22·62	
22	No. 112 ...	Grade Jersey ...	23 Aug. ,,	433	4·6	22·30	
23	Linnet ...	Ayrshire ...	13 Dec. ,,	467	4·0	20·92	
24	Wonder ...	Shorthorn ...	,,	355	5 6	22·26	

NEW PROCESS OF BUTTER-MAKING.

A VALUABLE DISCOVERY.

Something entirely new in the way of making butter which will keep is promised by M. B. L. Ehrmann, a French chemist. Every person with experience has been disappointed in the quality of butter taken from cold storage. The housewife frequently purchases a few pounds of good butter, possibly when the market price is low, but finds that this butter is scarcely fit for table use in two weeks. Various forms of preservatives, harmless and harmful, have been recommended for keeping butter, but none of them have the property of retaining in butter that delicate aroma which everyone enjoys. The demand is more and more for fresh butter, and it is difficult to sell cold storage goods at all, except in times of scarcity. If Mr. Ehrmann has really discovered a practical method of preserving butter, by a simple, harmless, and inexpensive method, he will have conferred a great benefit on mankind. Briefly, the process consists of blowing carbonic acid gas through the cream, or washing the cream or butter with carbonated water.

The following practical points in the process will be of general interest to readers, as given in the pamphlet received:—

"The quality of butter depends first of all on the quality of the cream, and the cream, during the time it is stored waiting to be manufactured into butter, is subject to many alterations detrimental to the value of the butter produced, and to its keeping qualities. The effect of carbonic acid is to prevent such alterations.

"When pure carbonic acid is used, the butter prepared by my process will retain its sweetness, freshness, and original flavour.

"The cream can be treated in two ways, either by the wet process or by the dry process. For the small farmer, a small cylinder of carbonic acid, with a reducing valve, will be a sufficiently convenient plant."

For the benefit of those not familiar with the nature of liquid carbonic acid, it is as well to mention that it is purchased from manufacturers, who send it out in heavy steel drums. The drums hold from 25 to 50 lb. of the liquid gas, which costs about 10 cents a lb. Such gas is used in the making of "pop," "ginger ale," and all similar soft drinks. The gas is also used in machines for producing refrigeration, and for the manufacture of artificial ice, &c.

According to the directions for using, the cream may be carbonated in the cans or in vats by blowing the gas through the cream, butter, and utensils.

"The quantity of carbonated water to be blown into the cream is about one-fifth of the quantity of the cream. More carbonated water is required in summer, also when the cream has to be sent to a distant place or factory, or has to be kept for a long time before being churned, or when the cream is over-ripe. If the butter has to be sent to a distant market, or to be kept for weeks, more carbonic acid is to be used in the cream.

"The cream can be churned directly after it has been carbonated, or some time afterwards, and the butter is manufactured as usual.

"Carbonated cream keeps sweet longer than non-carbonated cream. It is never desirable to carbonate the milk, as a quantity of carbonic acid would have to be used which is much larger than is required by the cream, and would be subsequently lost in the butter-milk."—"New Zealand T. and C. Life."

SIMPLE REMEDY FOR HOVEN.

A Western farmer, whose cattle were, some four years ago, affected with hoven, mentions how a friend saved the herd. The method was as follows:—Cut pieces of rounded wood (broom-handle is ideal) in lengths sufficient to leave an inch or so on each side of the mouth when the stick is placed between the jaws. Fasten a piece of binder twine or rope on either end and behind the horns, and force the stick well back between the jaws. This causes the animal to endeavour to eject the stick by working the jaws and tongue, producing antiperistaltic action, and the ejection of the gases. In the case in question the effect was magical, for the cattle belched up great quantities of gas, each emission relieving them. The bits were removed when the accumulation of gas ceased. This simple treatment saved the cattle, and no serious effect followed. For the subsequent four years no other treatment for hoven has been used by the farmer.

TO GET RID OF ANTS.

"How can I get rid of ants on the lawn?" asks a correspondent. For that matter, in the house as well. An exchange says the answer is as plain as A, B, C. Go to a druggist, get a pennyworth of carbon sulphide, pour a tablespoonful in the ant hole, cover the hole over with sacking or a bit of oil cloth, so the poisonous fumes will go down to the recess where the ants are holding jubilee over pure food prospects, and the wicked ant will rest from its labours and trouble the lawn no more.

ɪ oultry.

FINAL REPORT ON EGG-LAYING COMPETITION, APRIL, 1907, TO MARCH, 1908, QUEENSLAND AGRICULTURAL COLLEGE.

Our fourth laying competition closed on 31st March. There were twenty-five competing and three College pens, the latter being non-competitive, making up the number to twenty-eight. The total number of eggs laid during the twelve months was 30,543, an average of nearly 1091 per pen, or 181·8 per bird.

Feeding and General Management.—The following method of feeding was followed throughout the competition:—Bran and pollard for the morning meal, in the proportion of 1 part of bran to 2 of pollard (equal parts when the pollard was very floury) mixed with hot water, or soup made from boiling fresh bones, when obtainable, and occasionally separated milk, into a crumbly mass. Every alternative morning a little Sunlight oilcake was mixed with the pollard and bran, the bulk being made the same by the omission of some of the latter ingredients. About a pint of this mash was fed to each pen at 6·30 a.m. At noon, chaffed green lucerne (a good handful to each pen) was fed daily when there was no green grass in the runs, and a little soup meat was fed, when obtainable, twice a week; when this could not be had, it was replaced by ½-lb. of dried blood mixed in the morning mash, or a handful of poultry food to each pen. The evening feed consisted for the most part of wheat, with, twice a week, good heavy oats or sunflower seed during the summer months, and maize during the winter. The latter three grains were fed by way of variety, but wheat was the staple food; about 1 pint of the above grains was fed to each pen at 4·30 p.m. Shell grit and clean cool water were kept constantly before the birds, and they were at all times fed as much as they would eat up clean. The houses were cleaned out twice a week, and occasionally sprayed with Little's Sheep Dip, 1 pint to a kerosene tin full of water; this was found to be very effective in the case of vermin, and it also acts as a disinfectant.

Mortality.—A sharp lookout was always kept for any birds that did not come up for their food, or that were moping about, with the result that only eight birds died during the twelve months, while one became blind. All the above were replaced with the exception of two of Mrs. Mort's Buff Orpingtons, this pen having contained four birds only since the beginning of January. The fault was not ours, as competitors are always at once advised when a bird dies, a telegram being sent in cases where a letter will not arrive within a few hours. If competitors will not replace the birds, they are breaking the rules under which they have entered, the average of the pen and the gross returns are decreased, which is fair neither to the conductors of the competition nor the birds. It is to be hoped that this sort of thing will not occur again.

We had during the year a very large number of visitors to see the birds; many appeared to take a great interest in the competition, which formed an object lesson on utility poultry farming both to the general public and the College students.

Some of the Competitors.—Mr. A. H. Padman's White Leghorns—the winners—are medium-sized birds, very active, and with strong constitutions; the same birds ran right through the twelve months without a day's sickness. They commenced well, with 108 eggs for the first month, and never flagged until the last fortnight. They had good appetities (a very necessary quality for heavy laying), and wound up with a world's record, beating the previous

one by 44 eggs. The second pen—Mrs. Craig's White Leghorns—are somewhat larger birds then the winners; they also went right through the twelve months without death or sickness, and proved themselves to be good doers. They did not get away so well as the winners during the first two months, but afterwards laid remarkably well right to the finish, their total score being 1,432. The third pen—Rosecomb Minorcas, owned by Mrs. Cross—are also splendid layers, very hard, and fair eaters; no deaths or sickness occurred amongst them during the competition. They laid 1,043 eggs during the last eigh months, and 1,341 for the whole period. The fourth pen—Mr. Shillig's White Leghorns—also did good work; they were medium-sized birds, but rather small eaters. The Wharepaka White Leghorns also performed creditably, but were sent rather young to put up a first-class performance. Amongst the heavy breeds, the pen of S. L. Wyandottes, owned by Mr. W. Phillips, took the highest place with 1,200 eggs—a very good performance—and they laid consistently throughout. Geo. Robertson's Wyandottes also did remarkably well, considering that they were the smallest eaters in the competition. P. O'Neill's Black Orpingtons are good layers; but, owing to their large size, they took too long to get started; if they had been hatched a month earlier they would have commenced to lay earlier, and would have put up a good total; they laid remarkably well in the spring, but lost too much time through being broody during the summer months.

WARTS ON POULTRY.

Replying to a communication to the Department on the above subject, Mr. M. Fern, Poultry Expert, writes:—

1. Birds suffering from warts should be isolated, and the warts painted with carbolised vaseline or a paste made of sulphur, kerosene, and lard. Mix the sulphur well in with the lard or vaseline, and then add a few drops kerosene. Place Epsom salts in water—1 teaspoonful to quart of water—and give this to all kinds, sick or well, as it cools the blood and prevents attacks of this disease.

2. In the case of the tick, the only way to combat the pest is, after dipping the bird in a weak solution of any good cattle dip, to prevent the ticks from getting on to the bodies of the hens.

The tick harbours in the cracks of the fowlhouses, and comes out of its lair at night and attacks the birds. To prevent this, perches should be swung from the roof of the house, on trestles, the feet of which should be placed in tins containing kerosene, the roosts to be fastened to the top of the trestle, and they must not touch the sides of the house.

The house should be strongly fumigated, and, if procurable, tar should be liberally used on perches and about the house.

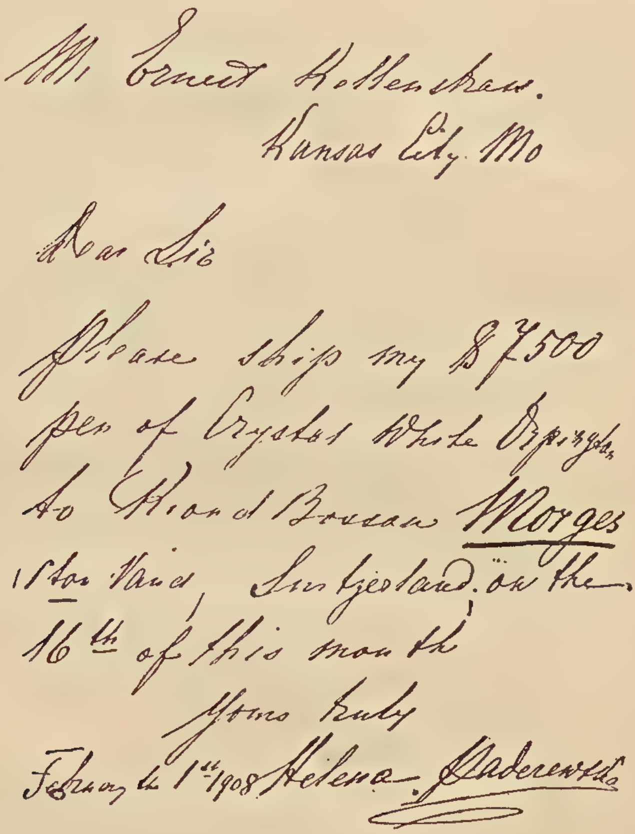
ENORMOUS PRICE FOR A PEN OF WHITE ORPINGTONS.

Our illustration of a pen of five beautiful White Orpingtons is taken from the "American Poultry Journal." These birds were originated on the Ernest Kellerstrass Poultry Farm at Dodson, near Kansas City, U.S.A. They were exhibited at the Madison Square Garden Show in January, 1908, and were purchased by Mme. Padarewska, wife of Ignace Jan Padarewski, the celebrated pianist. Mme. Padarewska is a poultry fancier, and at her home in Switzerland is famous as a poultry-rearer. She visited the Kellerstrass Farm, and purchased the birds here depicted for the enormous sum of 7,500 dollars, or

Plate XXVIII.

A Valuable Pen of White Orpingtons, for which £1,500 was Paid.

£1,500 sterling. The following is a fac-simile of her telegram, sent from her Pullman private car *en route* to her home at Morges, in the Canton de Vaud, Switzerland:—


Mr Ernest Kellerstrass.
Kansas City Mo

Dear Sir

Please ship my $7500
pen of Crystal White Orpingtons
to Riond Bosson Morges
Cton Vaud, Switzerland. on the
16th of this month
Yours truly
February the 1st 1908 Helena Paderewska

POULTRY EXPERT'S MOVEMENTS.

Mr. M. Fern, Poultry Expert, will visit the following places during the month of June:—

Gin Gin Show, 2nd and 3rd June.

Maryborough Poultry Show, 4th, 5th, and 6th June.

Kilkivan Junction, 7th June.

Kingaroy Show, 9th to 11th June.

Gympie district and Woondum, 12th and 13th June.

Deep Creek, 13th and 14th June.

Bundaberg Show, 16th, 17th, and 18th June.

Bundaberg and Woongarra district, 19th and 20th June.

The Orchard.

TROPICAL FRUITS AT ROCKHAMPTON.

We have received from Mr. R. Simmons, Curator of the Rockhampton Botanic Gardens, the photograph, here reproduced, of the jackfruit-tree (*Artocarpus integrifolia*) growing in the gardens. The tree is large-foliaged, an evergreen, which thrives particularly well in the Rockhampton district. It bears its fruit upon the stem and thicker branches. The fruit, when quite ripe, has a rather strong odour, which is disliked by some at first, but one soon gets accustomed to it. Besides, if the fruit is opened and allowed to stand for a short time before eating, the smell, which is not shared by the edible part, disappears. The tree is very prolific, being seldom without fruit. Another fruit which thrives well in the gardens is the Alligator Pear (*Persea gratissima*). One of the trees there is about twenty-three years old, and thrives well. It is a fairly large tree, evergreen, with oblong leaves of a bright green colour. The fruit, which is borne on the ends of the branches, has the appearance of a large pear, and weighs up to 2½ lb. It has a rich buttery flesh of a greenish-yellow colour, with a walnut flavour, so rich that many people make use of some condiment with it, such as pepper, salt, vinegar, wine, limejuice, or sugar. The soil in which the tree is growing in the gardens is of a sandy nature, about 4 feet deep, which has had one good dressing of manure in five years. Like the jack-tree, it requires no pruning other than keeping dead wood cut out. During long spells of dry weather it was watered about once a fortnight.

PICKLING OLIVES FOR HOME USE.

The growing of olives in Queensland, although long past the experimental stage, has not been prosecuted with the vigour which the great value of the fruit, both as an oil-producer and as pickled fruit, entitles it to. Wherever olive trees have been planted in this State they have thriven remarkably well, and have borne heavy crops of fruit, notwithstanding abuse and neglect. No better prof of the suitability of the Queensland climate for olive-growing can be given than the plantation at St. Helena Penal Establishment, in Moreton Bay. Many of the older trees on the island are of enormous size, and numbers of other trees planted on the slope of the hill have reached the bearing stage. The tree can withstand severe drought, and yet responds splendidly to good treatment, abundance of water, and culture. Writing on the olive in his pamphlet on "The Fruits of Queensland," Mr. A. H. Benson says:—

"A much-neglected fruit in this State, as it is also in most English-speaking countries. Few English people are fond of either the fruit or the oil, and yet it is probable that there is no tree that for the space it occupies will produce a greater annual return of food than the olive. A number of trees are scattered throughout the State, some of which are now of large size and fair age, but, so far, practically nothing beyond making a few gallons of oil and pickling a few gallons of fruit has been atempted, and this only in a purely experimental manner.

"The present condition of the olive industry is destined to have a wakening up ere long, as a country that can produce this fruit in such quantities and of such a quality as the lighter soils of the Darling Downs is destined some day to be one of the largest producers of olives on earth. Some years since I planted a number of the best varieties of olives—tree obtained direct from

Plate XXIX.

Jack Fruit Tree, in the Botanical Gardens, Rockhampton.

Plate XXX.

Jack Fruit—Half Natural Size. Weight, 19 lb. 10 oz.

California—on the Darling Downs, in land that I considered suitable for their growth, and which was properly prepared prior to planting. The trees here have made a really phenomenal growth, they came into bearing within three years of planting, and have borne steadily ever since. They have proved enormous bearers, and an experimental crushing showed that the oil was of high quality.

"There are large areas of similar country to that in which they are planted in different parts of the State, and I feel certain that this really valuable food fruit is bound some day to be a considerable source of our national wealth. So far, the drawback to the growth of olives has been the cost of gathering the fruit and the limited demand for the oil or pickled fruit, but against this, it has many advantages, one, and by no means the least, of which is, its value as a shade and shelter tree on our open treeless plains. It is also a very hardy tree, withstanding drought well, and thriving in land that is too stony for the cultivation of ordinary farm crops. It is a healthy tree, free from most fruit pests other than the olive scale, which can be kept in check by spraying or cyaniding; and last, but not least, it is an ornamental tree whose wood is of considerable value. The olive does best with us in loamy soils of fair depth and basaltic origin, that are moderately rich in lime and potash, and have a fair drainage. A subsoil of decomposed rock answers well. It will, however, do on several other kinds of soil, but it is in the type that I have just described that it does so well, and in which I would recommend its culture on a large scale. It will stand a fair amount of frost as well as great heat, and I have never seen the trees injured by either on our Downs country. I have also seen trees doing well right on the coast, where they have been subject to heavy rainfalls, so that it appears to adapt itself to the conditions prevailing in many parts of our State.

"The olive possesses one great qualification over almost every other known tree—that is, its permanency; once planted under suitable circumstances, and it is planted *practically for ever*. It attains an almost incredible age, and has been extensively cultivated for an unknown length of time.

"The popular belief that the olive is a slow-growing tree, and that it takes many years to come into bearing, must be considerably modified by facts deducible from the experience of modern growers. By careful selection of variety to suit climatic and other considerations, and with intelligent cultivation, the olive has proved itself to be productive as early as the orange."

Rr. A. Skinner, in "Timely Hints to Farmers" (University of Arizona) says:—

"The two varieties which yield the best products are the Mission and the Mazanillo. Both bear very large fruit. The Mission holds its colour well while being pickled. The Mazanillo is superior to the Mission in flavour, but the fruit is of a finer texture, and is prone to soften during treatment, nor is the colour of the finished product so good as that of the Mission.

"The fruit of the olive, either green or ripe, has a disagreeable, bitter taste, which is due to the presence of a vegetable principle known as 'olivil,' and before the fruit can become an acceptable article of food, the bitter principle must be removed. The old method practised prior to the past century, and which is still used to some extent in Southern Italy, is to place the fruit in bags in a stream of running water. By a process of leaching, the bitter substance is thus removed, and the fruit is ready for the brine. This method, in addition to requiring from three to six weeks for the leaching, requires exceedingly pure water for the process, and even then the olives are very liable to be ruined by mould and bacteria. It is, therefore, quite impracticable in this country. The method now generally used is to neutralise the olivil with weak soda or potash solution, afterwards removing the excess of alkali with pure water. This is the treatment now generally used on a large scale for processing olives. The soda and potash alkalies which are used are obtainable as commercial articles under the name of soda lye and potash lye. Of the several

methods tried, using different amounts of both potash and soda lye, the one which gave uniformly the best results was a combination of soda lye, lime, and salt. The object of the soda, as before stated, is to neutralise the bitter principle; the lime fixes the colour, as the use of soda alone causes the fruit to turn yellow, while the salt hardens the fruit, which has a tendency to soften when treated with lye, especially if the treatment is carried too far.

"The method of procedure is as follows:—The fruit, either green or ripe, is carefully picked into pails about one-third full of water, in order to prevent bruising. This is essential, as bruised fruit will swell during the lye process, and will spoil. The fruit should also be sorted, as it is desirable to have each lot of fruit of nearly uniform size and condition of ripeness, for the lye attacks the ripe fruit more rapidly than the green, consequently the ripe and small fruit would be finished, while the larger or green fruit would still be bitter. The fruit is then placed in stone jars, observing the same precautions in regard to bruising. Wooden kegs and pails may be used, but they are much more difficult to keep clean, and, when once impregnated with the mould which causes so much trouble, are very difficult to sterilise. The water should be drained off, and a solution prepared as follows poured over the fruit: To each gallon of water add 2 oz. of soda lye, 1 oz. of lime, and 1 oz. of common salt. Stir thoroughly and let stand for one hour, when it is ready for use. The water for making this solution should be boiled and cooled, thus retarding the growth of the mould which is likely to give trouble. The solution should cover the fruit about 2 inches, and should any of the fruit float, it is necessary to cover with a board and weight. The time of the lye treatment varies from three to seven days, according to the variety, size, and ripeness of the fruit. The solution should be examined daily, and should the slick, soapy feeling peculiar to lye disappear, it indicates that the solution is exhausted. The old solution should, therefore, be poured off and new solution added. It should also be changed at once should any scum or mould appear. The fruit should be frequently examined, always sampling the largest olives by cutting away a portion with a sharp knife. The progress of the lye towards the interior of the fruit is plainly marked by a distinct dark ring. When the ring has reached almost, but not quite, to the pit, it is time to remove the lye and commence the washing. The lye should be poured off and water added. Fresh water should be added morning and night. The wash water should also, if possible, be boiled, for at this stage the olives are an excellent host for the development of mould. The same precautions as above should be observed to keep the olives under water, and the vessels during extraction, washing, and salting should be kept closely covered. Depending upon the condition of the fruit, the washing requires from four to seven days to remove all traces of the alkali. This can be determined largely by the taste, for as long as any lye remains in the fruit it has a peculiar hot taste. After most of the lye has been removed, should the olives still be bitter, they may again be treated with lye solution. If the lye is allowed to act too long, however, the flavour is injured, and the fruit quickly softens and spoils. The treatment should be carried just far enough to neutralise all of the bitter principle, and no further. Experience and frequent testing are the only methods of determining this. To be absolutely sure that all lye is removed, which is necessary, the fruit should be tested with small bits of red litmus paper. To make the test, a half dozen of the largest olives are broken open and the paper pressed against the pits. The paper will turn blue if only a trace of the lye remains, and should such be the case, the washing should be continued until the paper gives no reaction.

"When free from lye the olives are then ready for salting. A brine should be made containing 2 oz. of common salt to the gallon of water. The solution should be thoroughly boiled and cooled and poured over the olives. The next day the 2 oz. solution should be removed, and a solution containing 4 oz. of salt should be used. If the stronger solution is used to begin with, the olives will shrivel. The fruit should next be treated with an 8 oz. brine, and if

intended to keep for some time, finally with a brine containing 14 oz. of salt to the gallon. A 14-oz. brine, however, makes the olives too salty to be used without a slight soaking.

"A better method of keeping the finished products is to process the olives after adding the 8-oz. brine. For this purpose I used Mason fruit jars and a large tin wash boiler, thoroughly cleaned. The jars were filled with olives and brine, rubbers and covers lightly screwed on, and the jars placed in water heated to 175 degrees Fahr. for thirty minutes. Jars were then removed and covers quickly tightened. By this process the flavour of the olive is not injured, and if properly done the fruit will keep at least several months without deteriorating."

THE FRUIT CASES ACT OF VICTORIA.

The following is a synopsis of the chief features of the Act:—

"Fruit" means apples, apricots, bananas, cherries, currants, figs, gooseberries, grapes, loquats, lemons, nectarines, oranges, passion fruit, peaches, pears, persimmons, pineapples, plums, quinces, or tomatoes, or any fruit which may hereafter be declared by notice in the "Government Gazette."

Baskets, trays, casks, buckets, or crates containing trays, and also patent cases which may have been patented before the commencement of the Act, may be of any size or shape, but must have the net weight or number of contents legibly marked on them.

Fruit may be sold, for two years after the passing of this Act, in any package whatsoever, provided the net weight of contents be truly and legibly marked thereon in letters of not less than 1 inch in length. The date of passing of this Act was 28th December, 1906.

Standard cases need not be so marked. This will allow time for the cases now in use to be displaced by the standard cases.

Second-hand cases will be allowed for local trade, but only new cases will be allowed for the export of fruit from Victoria.

A shrinkage of 5 per cent. on the cubical contents of case will be allowed in second-hand cases. No shrinkage will be allowed in new cases or in cases used for export.

The maker's name and address and the words "Guaranteed by the maker to contain two imperial bushels" (or bushel or half-bushel, as the size of the case may warrant) must be legibly and durably marked on each end of the outside of the case within a space measuring not more than 3 inches in length by $1\frac{1}{2}$ inches in width.

Penalties are provided for the infringement of any of the provisions of this Act.

STANDARD CASES.

For Local Trade.

1. Double or two-bushel cases: 26 by 12 by $14\frac{1}{4}$ inches (4,446 cubic), inside measurement and clear of divisions.

2. (*a*) Single or one-bushel cases: 26 by 6 by $14\frac{1}{4}$ inches (2,223 cubic), inside measurement and clear of divisions; or

(*b*) 18 by $8\frac{7}{8}$ by 14 inches (2,237 cubic), inside measurement, and no divisions allowed.

3. (*a*) Half or half-bushel cases; 26 by 6 by $7\frac{1}{8}$ inches (1,112 cubic), inside measurement and clear of all divisions; or

(*b*) 18 by 7 by $8\frac{7}{8}$ inches (1,119 cubic), inside measurements, no divisions allowed.

For Export Trade.

See 2 (*b*) and 3 (*b*) above.

Copies of this Act may be obtained in Victoria, from the Government Printer or any reputable stationer.

Horticulture

FLOWER GARDENING.—No. 5.

By THE EDITOR.

PLANTS SUITABLE NOR OUTDOOR CULTURE.

CHRYSANTHEMUMS.

There are few plants that respond so readily to liberal treatment as does the chrysanthemum. Of late years the rage has been to produce blooms of great size at the expense of number. These monster show blooms are right enough on the show table, but most people will agree with me that, for decorative purposes, the small and medium blooms commend themselves to the decoration of the dining-table or of the drawing-room. The varieties of the chrysanthemum are legion, and all can be grown in almost any part of Queensland. All it asks is a liberal supply of water during its growing period. Now, there are two ways of growing chrysanthemums. The first is generally adopted by the careless amateur. He gets a plant, sticks it in one corner of his garden, and trusts to Nature for the rest. He leaves it there, year after year, until it covers a square yard of ground. It produces a number of small flowers, and he is quite satisfied.

But the professional or enthusiastic amateur gardener goes about it in a very different way. He gets a plant, and takes every care to hasten and develop its growth; he feeds, waters, prunes, disbuds, and keeps it tied to stakes, and when the blooms appear he shades them from the hot rays of the sun. Now, I will tell you how to be successful with chrysanthemums: First of all, dig the land deeply, manure it heavily, drain it well, and thoroughly pulverise it. If the soil be clayey, add a few barrow-loads of sand or coal ashes, pounded oyster-shells, or broken coral. Having thus prepared the land, plant your suckers, and, as soon as growth commences, water well, and twice a week apply liquid manure. When the shoots are 6 inches high, pinch the top off; this will make them branch out. Allow three or four of the lateral branches so produced to grow to the height of 8 inches, and then pinch the tops off them to encourage lateral growth. On these laterals the flowers will be formed, and, if exhibition blooms are wanted, the flower buds must be thinned out to one or at most two of the terminal buds. If you want only medium blooms, nip off the terminal buds and leave the secondary, removing only those buds which are too close together. Now, keep a careful eye on the general growth of the plant to prevent the growth of too much wood. Remove all the young shoots which may appear anywhere below the flower shoots, being careful to leave sufficient foliage to keep the plant in health, always remembering that the leaves of all plants play an important part in their breathing and evaporating functions. Never allow the chrysanthemum to suffer for want of water. The wood of the plant being very brittle, a stake should be furnished to tie the stems to. Tie with some soft material to avoid injuring the bark.

When the flowering season is over and the plants begin to look shabby, cut them down level with the ground. Fork round the roots, add a good mulch, and let the plants remain until next spring planting season, which extends from October to January.

Chrysanthemums are divided into four groups, according to their general characteristis, as—

Incurved—the petals turn inwards;
Reflexed—the petals turn outwards;

Interlaced—the petals turn inwards; and

Anemone-flowered—the petals are quilled like the aster.

Japanese—the petals are large and irregular in shape, often parti-coloured.

Pompom—the petals are nearly always erect, and many-flowered.

To fertilise chrysanthemums, a French grower adopts a novel method. He collects all the remains of his old plants, dries them, and makes an extract by boiling them in water. This he uses as a liquid fertiliser, and he finds it very satisfactory.

GLADIOLUS.

The gladiolus belongs to the Iris family. The ixias, watsonias, crocus, &c., are its near relations. The genus contains a large number of species and varieties, most of which are exceedingly beautiful. In Queensland they thrive uncommonly well, although the blooms are not so lasting as they are in cool climates. To remedy this disability, a good plan is to keep the corms out of the ground as long as possible without causing them injury, so that they may flower when the great heat of summer is past. In order to have tall strong flower spikes, the corms should be planted in deeply trenched and highly enriched soil. The trenching should be from 2 to 3 feet deep, and 6 inches or more in depth of rotten stable manure should be mixed with the lower strata. In this the roots will luxuriate, and produce flower stems of immense size. In order to prolong the duration of the flowers, they may be planted under a framework that can be covered with a canvas shade. There are two sections commonly grown—the early and the late flowering. The former may be planted in autumn, the late-flowering as above directed.

The plant thrives best in a somewhat heavy yellow loam of an adhesive nature, without any admixture of sand. On such a soil a vigorous and healthy stock of gladioli may be kept up year after year, no matter whether the season be hot or cold, dry or wet. Attempts have been made by clever horticulturists to grow these flowers in light sandy soil, but the cultivation had to be abandoned. If you have a fair average soil, however, well worked and drained, you may be sure you will be successful in raising the gladiolus. They must not be planted in badly-drained, sour soil, or in manure (particularly fresh manure), in immediate contact with the bulbs.

Generally, in this State, the best time to commence planting is July or early in August. Plant singly, in clumps or in rows from 12 to 18 inches apart, and let the crown of the bulb be 4 inches below the surface; indeed, it may be planted 10 inches deep and left in the bed for years, until it gets too close to the surface. Every year the new bulb forms on top of the old one, so it rises about an inch annually. If a late frost cuts the young sprouts to the ground it continues to grow just the same, and is not discouraged by being cut back repeatedly. If the bulb is placed wrong side up it grows about as well; and if it has to stand in water for days, or endure drought for months, it will make the best of its opportunities, giving an abundance of bloom. When the first few flowers open, the spike may be cut and kept in the house as well as on the plant, giving constant bloom for one or two weeks, according as the weather is warm or cool.

In ten weeks some varieties will produce flowers, and others two or three weeks later. While growing, the gladiolus needs the same care that other crops do. Keep the ground clear of weeds, and hoe it occasionally, and stake the plant as soon as the flower buds appear. As soon as the leaves are yellow, lift the bulbs and store them in a cool place until the planting season comes round again. If you have a particularly choice variety, remember to preserve the small bulbils to be found more or less around the base of the mature plant. Plant these in a seed bed in drills. Most of these will grow and flower in the following season. If you grow year by year from the original bulb, the plants deteriorate, and the original at last runs out.

Gladioli are readily raised from seed, and will flower in the second season, sometimes before. Save from the best varieties, and sow in drills in the seed bed about 1 inch deep, and from 8 to 10 inches apart.

HOLLYHOCKS.

These old favourites of the English cottage garden certainly deserve a place in all Queensland flower gardens. The splendid double sorts, which have practically usurped the place of the single varieties, produce flower spikes 6 feet high, studded with splendid camelia-like blooms for some feet of their length. Hollyhocks are not difficult to grow from seed, if sown in autumn and liberally treated with rich soil and moisture. They are tender perennials. There are few plants more effective than well-grown specimens of the best double varieties.

The hollyhock thrives best in a deep, dry loam, trenched, with a liberal supply of well-rotted stable manure. It will not thrive in a wet, ill-drained soil. It is propagated by seed, cuttings, and division of roots. Whichever of these methods is adopted, the utmost care must be taken to avoid excess of moisture until the plants are strong enough to resist "damping off," which is usually the result of too copious watering.

Plant out during autumn or very early in the spring, when the soil is damp, but not sticky. During the hottest part of the day the plants require shade, and to afford this, tall shady shrubs may be planted at some distance from them, in such a way that the requisite shade is given without over-crowding them by strong plants growing close to them. The ground should be mulched with long stable litter, which will protect the roots and also stimulate growth. In dry weather give a reasonable amount of water occasionally, but avoid drenching the soil. When the buds are formed upon the spikes the plants should be watered every other day with liquid manure. The spikes should be tied to stakes to protect them from injury from high winds.

When the plants have done flowering, gather the seeds early, so that the old flowering spike may be cut off to encourage the root to throw up shoots for cuttings. Sow the seed as soon as it is ripe, and, by transplanting the young plants, when large enough, into separate pots, they will be strong for blooming during the next spring and summer.

Although hollyhocks generally come true to seed, yet, when it is desired to increase approved sorts, it is well to resort to cuttings, as they strike very readily.

PETUNIAS.

The petunia as a summer flower is much neglected. It is essentially a lover of hot weather, and, given even a moderate supply of water, will make a grand show in the garden. Next to their beauty, variety, and fragrance is the fact that they are most constant bloomers, remaining in flower from early summer until cut by the frost. To keep up a constant supply of bloom the plants should be repeatedly cut back. Any ordinary garden soil suits them, and the young plants should be placed 12 inches apart. Plants from seed sown in March will flower before they are checked by the cold weather, and a light covering of bushes over the plants will be sufficient protection for an ordinary winter in this climate. The plants grow so easily from seed that it is only necessary to protect a few really good varieties for growing the following year. The double-fringed variety is most handsome, and, as it is a greedy feeder, should be given plenty of stable manure while the plants are growing strongly. Old plants may be cut close down in spring and started in heat, or cuttings may be struck in spring to flower the same season. They require rich soil, and, if grown in pots, plenty of pot-room.

Petunias, in their many beautiful varieties, form a highly interesting and desirable class of free-flowering plants for garden culture, those of the grandiflora section, both single and double flowered, being specially valuable. The

blooms of these are of immense size, beautifully formed, and of the most charming and delicate colours; some of the flowers are exquisitely veined or pencilled, others blotched or striped. The "fringed" varieties (both double and single, produce some charming flowers, the edges of the petals being elegantly cut or fringed, whilst the colours are most varied and beautiful. The petunia is well adapted for pot cultivation, and on account of its hardiness and free-blooming qualities, makes an excellent window or veranda plant. A soil composed of equal parts of loam and thoroughly decayed cow dung, with plenty of sharp sand added, forms an excellent compost for these; but the seeds, being very small, require special care in sowing. Fill your pots or seed pans to near the rim, and press the soil down firmly and evenly; sow thinly, and cover the seeds very lightly with fine soil, and keep it moist. As soon as the young plants are fit to handle they may be planted into the places where they are to remain, taking care to shade and water them till they are thoroughly established, or they may be put into small plots and planted out when larger. Petunias may be sown in autumn and spring.

SOME GOOD VARIETIES.

Belle Etoile.—A beautiful, large-flowered strain, striped and blotched.

Grandiflora superbissima.—A magnificent variety, produces enormous flowers with handsome tigred throat.

Giant of California.—Exquisitely fringed and of enormous dimensions, often measuring 5 inches across. Their great merit, however, lies in the marvellous variations in colour, some of the flowers having deep throats of yellow, white, black-green, and maroon, running off into intricate veins of exquisitely-pencilled combinations quite new in petunias. The flowers are of great substance.

Baby Blue.—It begins to bloom when only a few inches in height, and flowers profusely until killed by frost. The flowers measure only 1½ inch across, and are a soft reddish purple, but when seen *en masse* in strong sunlight appear a lovely blue; small, very dark-green leaves.

Large-flowered Single, and Double-fringed.

HYDRANGEA.

Hydrangeas are of easy culture, and are exceedingly ornamental, whether grown in the bush-house or in the open. The sorts having abortive or sterile flowers, with an enlarged calyx, are the most ornamental.

Propagation is readily effected from cuttings of young or partially ripened shoots, which may be inserted at almost any time when they are procurable. Old plants may be divided for propagation. For culture outside, a somewhat sheltered situation should be selected, except in favourable localities.

Cultivation.—No special directions are needed for the cultivation of hydrangeas in the open garden. They may be propagated annually to produce one head of flowers each—a method largely practised—or they may be grown as shrubby plants for several years in succession. Cuttings should be inserted in small single pots and plunged in a close warm frame. Take the cuttings in spring from young growths which are not bearing flowers. Another plan is to let the old plants grow all the season, and put in strong points as cuttings when partially ripened. Select the tops of the strongest and most prominent shoots for cuttings, and insert them in March. When they are rooted, gradually harden off, and expose them to full sunshine and air in autumn. The embryo buds formed at this period will expand in the spring, but it is not usual for all to flower. As a rule, the flower appears with the fourth pair of leaves, and should the plant develop so far without the embryo being seen, throw it away unless it is required for another year. A new stock of these dwarf pot plants should be propagated annually, and the old ones be used for planting out in the open.

Hydrangeas like a rich soil, such as loam and decayed cow manure in equal parts. Any quantity of water may be applied in the growing season, and artificial manure, given just as the flowers are developing, invariably proves beneficial. The flowers sometimes turn blue, certain soils having the property of changing the normal colour in consequence of the presence of some chemical constituent. Water in which alum has been dissolved is used to artificially produce the same effect. In some gardens plants which produce red flowers one year may develop blue ones the next, and this without any influence or skill on the part of the cultivator.

A large bush will often, it is said, absorb as much as 12 gallons of water in a single day.

TWO GOOD VARIETIES.

Hydrangea hortensis, and some of its varieties, have nearly all sterile flowers, and are consequently most popular. *H. paniculata grandiflora* is very handsome, and amongst the best, either for pot culture or for outside treatment. The American species are hardier, but not so ornamental as those from China and Japan.

Times of Sunrise and Sunset at Brisbane, 1908.

DATE.	MAY.		JUNE.		JULY.		AUGUST.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·30	5·0	6·39	5·4	6·30	5·18
2	6·14	5 15	6·31	5·0	6·39	5·4	6·29	5·19
3	6·15	5·15	6·31	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·5	6·28	5·20
5	6·16	5·13	6·32	5·0	6·39	5·5	6·28	5·20
6	6·16	5·12	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·33	4·59	6·39	5·6	6·26	5·21
8	6·17	5·11	6·33	4·59	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·7	6·24	5·22
10	6·18	5·10	6·34	4·59	6 39	5·7	6·24	5·23
11	6·19	5·9	6·35	4·59	6·39	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·38	5·8	6·22	5·24
13	6·20	5·8	6·36	4·59	6·38	5·8	6·21	5·24
14	6·21	5·7	6·36	4·59	6·38	5·9	6·21	5 25
15	6·21	5·7	6 36	4·59	6·38	5·9	6·20	5·25
16	6·22	5·6	6·37	5·0	6·37	5·10	6·19	5·26
17	6·22	5·6	6·37	5·0	6·37	5·10	6·18	5·26
18	6·23	5·5	6·37	5·0	6·37	5·11	6·17	5·27
19	6·23	5·5	6·37	5·0	6·37	5·11	6·16	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·15	5·28
21	6·25	5·4	6·38	5·1	6·36	5·12	6·14	5·28
22	6·25	5 3	6·38	5·1	6·35	5·13	6·13	5·29
23	6·26	5·3	6·38	5·1	6·35	5·13	6·12	5·29
24	6·26	5·2	6·39	5·1	6·34	5·14	6·11	5·30
25	6·27	5·2	6·39	5·1	6 34	5·14	6·10	5·30
26	6·28	5·1	6·39	5·2	6·34	5·15	6·9	5·31
27	6·28	5·1	6·39	5·2	6·33	5·15	6·8	5·31
28	6·29	5 1	6·39	5·3	6·32	5·16	6·7	5·31
29	6·29	5·1	6·39	5·3	6·32	5·17	6·6	5·32
30	6 30	5·0	6·40	5·3	6·31	5·17	6·5	5·32
31	6 30	5·0	...	...	6·31	5·18	6·4	5·33

PHASES OF THE MOON.

		H. M.
1 May	New Moon	1 33 a.m.
8 ,,	☾ First Quarter	9 23 p.m.
16 ,,	○ Full Moon	2 32 ,,
23 ,,	☽ Last Quarter	10 17 a.m.
30 ,,	New Moon	1 14 p.m.
7 June	☾ First Quarter	2 56 p.m.
14 ,,	○ Full Moon	11 55 ,,
21 ,,	☽ Last Quarter	3 26 ,,
29 ,,	New Moon	2 31 a.m.
7 July	☾ First Quarter	6 25 a.m.
14 ,,	○ Full Moon	7 48 ,,
21 ,,	☽ Last Quarter	10 2 p.m.
28 ,,	New Moon	5 17 ,,
5 Aug.	☾ First Quarter	7 40 p.m.
12 ,,	○ Full Moon	2 59 ,,
19 ,,	☽ Last Quarter	7 25 a.m.
27 ,,	New Moon	8 59 ,,

Tropical Industries.

COCOANUT-PLANTING, TERRITORY OF PAPUA.

(From particulars supplied by Mr. N. R. Schroder to "Dalgety's Review.")

The interest which is being aroused in the Commonwealth at the present time by the possibilities of the territory of Papua for cocoanut and rubber cultivation has induced Mr. N. R. Schroder, of Milne Bay, Papua, to send us some particulars of the former industry, which we have pleasure in publishing for the information of any intending planters.

The territory is situated outside the hurricane zone, has an agreeable climate, and a plentiful rainfall (except in the dry belt of the Central Division). Thus, the planter has every advantage which Nature can bestow to render his enterprise successful.

The soil is considered equal in richness to any in the world, and our correspondent's experience leads him to express it as his opinion that, in the course of a few years, when Australia has realised what a valuable asset she possesses right at her very doors, Papua will have become the most prolific and richest exporter of tropical products outside of Ceylon. Labour is plentiful and cheap, and land easily obtainable on the most liberal terms.

A good deal has been written on the subject of cocoanut-planting during the last few years, mostly by people in India, but comparatively little has been said by those conversant with the conditions obtaining in the South Sea Islands and British New Guinea to help intending planters who may be thinking of taking up land in Papua.

With regard to choice of land for cultivation, if no island is available, and land is taken up on the mainland, it should be as flat as possible. If a river or two run through the property, so much the better. They will help to irrigate the land, and cocoanuts require a great deal of water (running, not stagnant); if there are any swamps they must be thoroughly drained before any planting is attempted.

After land has been taken up, the next step is to obtain labour to cultivate it. "Boys" may be had from the local recruiting vessels at from £1 15s. to £2 per head (for one-year boys). These figures refer to New Guinea. In the Solomon Islands the rate is from £4 to £6 per head for three-year boys. The food of these labourers consists of rice, sweet potatoes, with meat twice a week. They also get a tobacco allowance of, say, two sticks per week. Their only requirement in the matter of clothing is one Lava-lava every three months, and one blanket per boy per annum.

There are many ways of clearing land, but the following method has been found the best. After the forest has been cut down, lop off all the branches of trees and then run a fire through. After this, stack all unburnt timber around stumps and big logs, and fire once again. Do this twice so as to leave as little dead timber as possible on the plantation. The timber, if left to rot, will in time manure the ground, but this method entails the harbourage of an immense number of grubs and beetles, and these insects, breeding rapidly, leave the old logs and take up their residence in the young sweet cocoanuts, causing untold damage. By firing the ground thoroughly, these insect pests are kept within bounds.

NURSERIES.

If there are no plantation near where seed nuts may be obtained, great care must be taken in the selection of nuts for planting. It is better to depend on the natives for them, and to go personally and buy them, inspecting the cocoanut-trees, and picking the nuts therefrom, taking particular care that the tree is not too old or too thin or too tall, but a young, vigorous, solid, and stout tree; also seeing that the nuts it bears are plentiful in number, and of a good shape. They should not be long and narrow, but round, with little

husk and plenty of milk. Open them and note how thick the flesh is. Do not always choose the big-looking nuts, as they may have a very large husk and yet be small in the nut proper. Take no nuts from yellow-looking trees. The dark-green trees are the best.

Having gathered all the seed nuts required, make a nursery, hoeing up the ground to a depth of about 1 foot, and removing all weeds. In setting the seed cocoanut cover about two-thirds of it, laying it at an angle of about 45 degrees in the earth, covering lightly with leaves. When the young trees have reached a height of 12 or 18 inches transplant to the plantation, being careful to pick out all the healthiest and to condemn the weak ones. This will be in about three months after the setting in the nursery.

From the foregoing it will be seen that it is advisable to get the nursery going early, so as to be ready to plant out when land has been cleared and got ready to receive the young plants. No time is, therefore, lost by this arrangement. Advantage should always be taken of a downpour of rain, and planting out should be undertaken immediately the ground is sufficiently moistened.

In transplanting, a sharp knife should be used in order to slice the roots off close to the husk. Holes should be dug about 2 feet in depth and 2 feet in diameter, and the nut planted therein about 9 inches below the surface, a filling of 9 inches of surface mould being placed at the bottom of the hole. The nut should then be completely covered. Keep a ring of about 12 feet in diameter around each plant, and the intervening ground well hoed and free from weeds, because the roots require a great deal of air and light during the first three years of the plant's existence.

The lining out of nuts should be done very carefully, so that the trees are in line both horizontally and traversely, and so that they are not more than 30 feet apart. No other trees should be planted in between. Some planters have planted 33 feet apart, and are now putting rubber between the rows. This is considered a mistake, as both classes take a great deal out of the ground, and as they attain to maturity their roots will become interlocked. Thus they will be fighting for supremacy beneath the surface, and are bound to cripple each other in the long run. If it is desired to cultivate both classes of trees, Mr. Schroder's advice is to strictly plant them apart.

INSECT PESTS.

Beetles will, of course, be found on every plantation, however well kept it may be; but the clearing of the land of all dead timber will make the number very much less than if the logs were left to rot away on the ground. More beetles have been found in the cocoanut-trees planted on the outskirts of a plantation where the bush is rubbing shoulders, so to speak, than in the plantation itself, whence all dead timber has been removed.

There are several kinds of beetles inimical to cocoanuts. The big "Rhinoceros" species seems to do most damage. This beetle grows to a length of 2 inches and a girth of 1 inch. It burrows a way through the young trees right into the soft heart. It does not require much imagination to estimate the damage this pest can cause. The tree will look quite healthy, new shoots will spring out, and cocoanuts appear as on any other tree, but the nuts will never ripen—as soon as the flesh begins to form in it the nut will drop off.

Until the beetle has been got out of the tree, the planter need not look for any return for all his work and outlay of money; for the creature will continue to eat its way upwards towards the new shoots, and all the nuts will be affected the same as the first. This beetle, however, can be extracted by an easy process.

Procure a wire about 3 feet in length, with a handle at one end and the other end twisted corkscrew fashion. Now, look under the leaves and you will notice that the cloth around the tree appears as if it had been chewed by a rat; pull it away and the beetle's hole will be visible; then push the wire up as far as it will go, twist it round, and in nine instances out of ten you will succeed in extracting the beetle. Dust the leaves near the trunk with Paris

green, also putting Paris green in the hole. This will destroy any eggs the beetle may have left behind. A boy can be taught this method, and in a very little time he will become quite an expert. It is well, however, to give him a tin and to make him bring the captured beetles to you. It will be a matter of surprise what a large number he will find on a plantation where the logs have been left to rot on the ground between the trees.

Another small beetle which is very plentiful attains a length of ½-inch, but is very thin. It has a light-brown head and a dark body. This insect enters very young trees and feeds on the leaf that is just forming. Trees that are infested with this pest are easily distinguishable, for dry spots appear on the leaves. The presence of the beetle does not kill the tree, but retards its growth considerably. Wood ashes or Paris green is an effective remedy; open out the new leaf very carefully and dust in the same manner as for the "Rhinoceros" beetle.

The grub is another source of annoyance to the cocoanut-planter. He enters the tree from the roots and works his way upwards. His presence can be detected by the grating sound which he makes. When the sound has been located a hole should be cut in the tree and the grub extracted. Fortunately, this pest is seldom met with, and visitations are rare from it in Papua.

If the plantation be near the sea-front, all intervening timber should be cut away right down to the water's edge, as the cocoanuts require plenty of air, and the salt sea breeze is very beneficial to them. Seaweed, too, makes an excellent manure, and helps the young nut considerably. It may be remarked here that the first two flowers should be cut off, as this strengthens the young tree.

ESTIMATE OF EXPENSES AND RETURNS.

For the further guidance of intending investors, a table is appended which gives approximately Mr. Schroder's idea of the expenses incurred in running two plantations of 1,000 acres, and of the profits to be derived therefrom.

This estimate, our correspondent mentions, is based upon a very low price for the product—viz., £10 per ton. Copra he puts down at £16 per ton in Sydney; but £10 he considers a bed-rock figure, below which the market is very unlikely to go for many years.

Expenses for First Year.—Area Planted, 500 Acres.

	£
Manager	300
Assistant manager	200
200 boys	900
Tools	125
33,000 seed nuts (imported)	231
Food for boys	150
Incidentals	100
Recruiting, tobacco, medicine, blankets	500
Returning boys	100
Manager's and assistant's house	250
	£2,856

Second Year.—Area Planted, 300 Acres.

	£
Manager	300
Assistant manager	200
150 boys	597
20,000 seed nuts	140
Food for boys	125
Recruiting, tobacco, medicine, blankets	400
Returning boys	75
Incidentals	100
	£1,937

Third Year.—Area Planted, 180 Acres.

	£
Manager	300
Assistant manager	200
100 boys	450
11,000 seed nuts	77
Recruiting, &c.	350
Incidentals	100
Food for boys	75
Returning boys	50
	£1,602

Fourth, Fifth, Sixth, Seventh, and Eighth Years.

	£
Manager	300
Boys	450
Tools	50
Recruiting, &c.	350
Food	75
Returning boys	50
Incidentals	100
Two native overseers	48
	£1,423

Summary.

	£
First year	2,856
Second year	1,937
Third year	1,602
Fourth, fifth, sixth, seventh, and eighth years ...	7,115
	£12,510

Expenses per Year 1,000 Acres Fully Planted and Bearing.

	£
Manager	300
Two native overseers	48
Boys' wages	450
Freight to Sydney, £1 10s. per ton...	984
Insurance, commission, 5s. per ton	164
Incidentals	100
Imports	100
Recruiting and returning boys, &c.	300
	£2,446

1,000 Acres, Bearing 53 Trees to 1 Acre.

1,000	acres
53	trees to 1 acre
53,000	trees in all
60	nuts on each tree (low estimate)
3,280,000	nuts in all

5,000 nuts to 1 ton copra

656 tons copra per year

£10 per ton Sydney price

£6,560 income per annum

Total Income, Expenses, and Net Income 1,000 Acres, Fully Bearing.

	£
Income	6,560
Expenses	2,446
Net income	£4,114

During the first six years there is no income to speak of, with only a little during the seventh and eighth years. It is in the early stages, says Mr. Schroder, all expenses and hard work, but, with the exercise of economy, a 1,000-acre plantation ought to be brought to maturity for £13,500.

NOTES ON RUBBER IN TROPICAL AUSTRALIA.

By HOWARD NEWPORT, F.R.H.S., Instructor in Tropical Agriculture and Director of the Kamerunga State Nursery.

To those concerned in the extension of rubber cultivation in Queensland recently, the following figures may be of interest. Of the plants imported by Mr. F. P. Logan, in January, 1907, 4,040 were finally distributed; of the Department's special importation in January, 1908, including plants raised from seed obtained at the same time, 7,434 plants resulted; plants raised from seed at the Kamerunga State Nursery, including seed distributed (allowing for a 52 per cent. germination only), 4,726 plants. This gives a total of 16,200 plants distributed up to the end of April, 1907, equal to an area of 81 acres if planted 14 by 14 feet (or 200 to the acre), and if all were planted in definite areas, which, of course, they are not, many having planted but a few trees in their gardens and along roadsides, &c., in their farms.

The foregoing figures refer only to Pará Rubber (*Hevea Braziliensis*). Of other rubbers, mostly Assam or Rambong (*Ficus elastica*); Central American (*Castilloa elastica*); Ceara (*Manihot glaziovii*); and African (*Funtumia elastica*), enough plants have been distributed to plant about 7 acres, as well as some 11,000 seed.

Of the Department's first importation in January of this year, the seed imported resulted in a germination of about 37 per cent., and the plants suffered a mortality *en route* of about 20 per cent. This was, however, mainly due to the consignment having been unfortunately carried on to Brisbane and returned to Cairns, involving an extra fortnight at sea, instead of having been landed in the North. Of the plants thus imported, some 2,500 are still in hand, but have all (and more) been bespoken, and are awaiting despatch.

The Department is making another importation of some 10,000 seed or plants, and it would be as well for intending growers to bespeak these as soon as possible to ensure getting the number they want.

The Pará rubber plants put out in banana plantations that are still being worked, and in which the rubber can benefit by the clean weeding and partial shade, are doing remarkably well in the vicinity of the Tully River, near Cardwell, and Johnstone River, at Geraldton. Many of these plants, barely 18 inches high, and as thick as fencing wire when planted, now show 7 feet in height and a circumference of 3 inches at the ground for the year's growth.

Having been planted among the bananas, they participated in the cultivation, and thus the cost of upkeep has been practically nil. By the time the

bananas are, according to the Chinese ideas, worked out, the rubber should be big enough to tap.

Regarding the value of land so planted, it will be interesting to note that the "Times of Ceylon" suggests that £100 per acre would be a moderate price for six-year-old rubber.

If only all the land that has been under bananas and subsequently abandoned, or even the land now being cultivated with bananas, were so planted, and became, with little or no cost, five or six year old rubber plantations when no longer required for bananas, what an asset to the State, not to mention the landowner, and what a contrast to the present methods whereby such abandoned areas grow only noxious weed!

The price of rubber has dropped considerably since this time last year, and good plantation Pará now fetches between 3s. and 4s. per lb. It is, however, expected to rise somewhat, though not to the figures of last year. Despite this, however, the opinion of those most interested, as shown in the following extracts from the "India Rubber World" for March, will be of interest:—

"Mr. James Wilson, of England, chairman of the Ceylon Land and Produce Company, on seven of whose plantation 5,695 acres have been planted to rubber, after a recent visit to Ceylon, expressed the opinion that rubber planting will pay for many years to come. He thinks that the price ought to rise a bit when the money market resumes its normal condition, but not to the high prices of a year ago.

"A planter from Ceylon, who visited England lately, reports an interview he had with one of the directors of the India Rubber, Gutta Percha, and Telegraph Works Company, at Silvertown, who expressed the opinion that rubber planting would be a good investment for the next twenty years at least. The rubber manufacturer felt that if rubber remains as cheap as now, a marked increase in its use would result."

Rubber is being extensively planted in the tropical countries all round us. In Sumatra alone, a correspondent of the "Ceylon Observer" states that 2,000,000 trees, representing 14,000 acres, have been planted. He adds that three rubber trees on an old coffee plantation are reputed to have yielded over 5 kilograms (11 lb.) each in one year.

Even at a profit of 1s. per lb., and a production of 1 lb. per tree, the return per acre of 200 trees is good; at 3 lb. per tree it will compare favourably with any agricultural product whatever in the country; and, with a possibility of such returns as above quoted, or even a portion of it, the returns, to say the least, are attractive enough for the most sanguine.

Rubber companies are quoting 15 to 30 per cent. dividends per annum in Ceylon, the Straits Settlements, Java, Sumatra, &c., and will shortly be doing so in the Solomon Islands and Papua. Why not in North Queensland?

One more quotation, *re* synthetic rubber from the "India Rubber World" is to the point:—

"While a great deal has been printed in England and the British colonies during the past year on the subject of 'artificial' or 'synthetic' rubber, and the possibility of some such material competing with natural rubber, it does not appear that any real progress has been made in the new field. In other words, the rumours referred to have served only to scare some investors in rubber-planting companies. The sentiment of the British crude rubber trade, after a year of such rumour-mongering, is well expressed in this paragraph from the review of the trade for 1907, issued by Lewis and Peat, London rubber brokers:—'During the past year artificial rubber has been talked about a great deal, but, so far, nothing tangible has been forthcoming, and we do not know anyone in the rubber trade of any importance or authority who believes in the likelihood of the production of a substitute for the real article, or has seen a sample of it, and at the lower range of prices for all kinds of rubber and the increasing supplies the danger now from this source is more remote than ever.'"

Chemistry.

ELEMENTARY LESSONS ON THE CHEMISTRY OF THE FARM, DAIRY, AND HOUSEHOLD.

By J. C. BRÜNNICH, Agricultural Chemist.

TWENTY-THIRD LESSON.

INSECTICIDES. FUNGICIDES. DESTRUCTION OF WEEDS.

Chemistry has to come to the aid of the farmer in his continual battle with insect pests, plant diseases, and weeds; and for this reason it will be of some value to devote this, our last lesson, to a short study of the chemicals which are used as preventives and remedies.

Insecticides.—When making choice of a remedy for the destruction of insects, or if they such the food, like plant lice and true bugs. Gnawing their food; if they chew or bite the food, like most of the beetles and larvæ of insects; or if they suck the food, like plant lice and true bugs. **Gnawing insects** may be destroyed by coating leaves and stems of plants with a poisonous substance which does not injure the plants. **Sucking insects** can only be destroyed by substances externally applied to the insects, which either cause death by a corrosive or irritating action on the skin, or by a mechanical action of closing the breathing pores. Certain other substances are also frequently used, which prevent the attack of insects, either mechanically by acting as a barrier, or, again, by keeping the insects away on account of powerful offensive odours of the substances. All insects which bore into fruit, branches, trunks, and roots of plants will have to be treated in different manners, and a full account of such treatments are given in the pamphlet on "**Citrus Culture**," by A. H. Benson, Instructor in Fruit Culture, published by the Department of Agriculture and Stock, in January, 1908.

The principal **Food Poisons** used against insects devouring their food are **arsenical preparations**, in a more or less soluble form. The more insoluble the preparation the less will be the injury to the plants.

Arsenious acid, or white arsenic, As_2O_3, is the active ingredient of all the arsenical poisons, but cannot by itself be used as an insecticide on account of the strong corrosive action on the foliage. It is an extremely poisonous substance, as about 2 grains can be fatal to an adult, 10 grains usually kill a cow, 30 grains are fatal to a horse, and 1 grain will kill a cat or dog. The greatest care has, therefore, to be exercised in the use of all insecticides containing arsenic.

The principal arsenic compounds used are: *Lead Arsenate, Scheele's Green, Paris Green,* and *London Purple,* enumerated in order of their solubility, the first preparation being the most insoluble one. The preparations are generally applied after suspension in water as a spray. All the compounds are very heavy salts, and readily settle down in the spraying liquid, which, therefore, must be kept well stirred during the spraying operation. The operation should not be done during rainy weather, on very hot sunny days, or when strong drying winds are blowing.

Lead Arsenate is obtained as an exceedingly fine white precipitate, when a solution of sodium arsenate is mixed with a solution of lead acetate (sugar of lead). The preparation is used at the rate of 1 to 2 lb. of lead arsenate to 150 gallons of water, but can be applied very much stronger without doing injury to the plants.

Scheele's Green, or Copper Arsenite, $CuHAsO_3$, is at present rarely used, being entirely replaced by

Paris Green (Schweinfurt or Emerald Green), a cupric arsenite and acetate 3 $(CuAs_2O_4)$, Cu $(C_2H_3O_2)_2$, which should contain not less than 50 per cent. of arsenic, of which only a very small trace should be soluble in water. The soluble arsenic causes injury to the foliage, and this may be avoided by adding to the prepared spray some freshly slaked lime (about twice the bulk of lime as of Paris Green).

London Purple is an arsenite of lime, obtained as a by-product in the manufacture of aniline dyes, which contains about the same amount of arsenic as Paris Green, but in a much finer form, which remains longer in suspension. The preparation, however, is slightly more soluble, and, therefore, more liable to injure the foliage, which may be overcome by using an excess of lime. This compound is the active ingredient of **Kedzie's Mixture,** a preparation often used as a spray.

For the destruction of sucking insects **contact poisons** have to be used, of which the principal ones are: *Soaps and oils* (in form of emulsions), *resin washes, sulphur,* and its compounds; and a few finely-powdered vegetable substances, like *pyrethrum, hellebore,* and *tobacco dust.* With contact poisons may be included the destruction of insects of all classes by the *fumigation with poisonous gases.*

Pyrethrum, Persian or Dalmatian Insect Powder, Insectibane, &c., consists of the finely-ground flowers of plants of the genus Pyrethrum. It may be used as a dry powder, or in the form of a decoction made with water, alcohol, or kerosene, and also by the fumes produced on heating or burning the dry powder.

Hellebore is a fine brownish powder made from the roots of the White Hellebore Plant (*Veratrum album*), containing a vegetable poison, which kills insects both by contact and by being eaten. It is used in the dry state or as a watery decoction.

Tobacco dust owes its value to the vegetable poison nicotine; it is used in a dry state, as a decoction, or, again, in the form of smoke. The refuse of cigar and tobacco factories is largely used for the manufacture of various preparations.

Sulphur in the form of flowers of sulphur is also used as an insecticide, and becomes much more active when boiled with lime or with caustic soda, so as to form calcium sulphide and sodium sulphide.

Kerosene can be used in its crude state as an insecticide, but many plants are injured by its application; and, for this reason, kerosene, crude petroleums, and similar oils are generally used in a diluted form as an **emulsion,** made with soap and water or with sour milk. A good kerosene emulsion is made by dissolving ½-lb. of soft soap—preferably whale-oil soap—in 1 gallon of boiling water, adding 2 gallons of kerosene, and churning the mixture with the aid of a spray pump, syringe, or an atomiser for at least ten minutes, until the liquid has been changed into a creamy mass. One gallon of this emulsion is diluted with 7 gallons of water, and applied with a spray pump. A very good emulsion is also made by churning 2 gallons of kerosene with 1 gallon of slightly warmed sour milk, and diluting this emulsion 7 to 10 times with water.

Resin washes are largely used for scale insects, and are made by boiling resin, fish oil, caustic soda, and water for several hours. Dissolve in an iron boiler ½-lb. caustic soda (95 per cent.) in 2 gallons of water, boil, add 2 lb. resin, and about ½-pint of fish oil, keep boiling for two to three hours, add slowly, stirring all the time, 3 gallons boiling water, and finally enough cold water to make 8 gallons of wash. The wash can be applied still warm.

Many of the preparations enumerated are also used for the destruction of parasites and vermin on domestic animals. Sheep, for instance, require regular dressing with an insecticide, by either bathing, dipping, or smearing, in order to prevent the attacks of insects, to destroy insects and also their eggs. **Non-poisonous and poisonous sheep dips** are used, the former consist chiefly of carbolic acid (Phenols) and similar chemical compounds, soft soap, and also

frequently some sulphur compounds. Such dips kill the insects, but do not destroy the eggs, and frequent dippings are necessary. Poisonous dips kill both insects and their eggs; they contain arsenic in a soluble form, and also frequently the compounds found in non-poisonous dips.

Dipping with poisonous insecticides is largely used for the destruction of cattle ticks; and, so far, from experiences gained in this State, solutions containing not less than $\frac{1}{5}$ per cent. or ·2 per cent. of arsenic are found most effective. Small amounts of soap and Stockholm tar are generally added to the solutions to make them more adhesive. The solution used for dipping cattle is prepared by boiling arsenic and caustic soda dissolved in water until the whole of the arsenic has dissolved in form of sodium arsenite. In another portion of water Stockholm tar, tallow, and caustic soda are boiled until the whole of the tar has been dissolved, and this solution mixed with the arsenical solution and made up to such a volume as to contain not less than 8 lb. of arsenic per 400 gallons of fluid. As the method of preparation is not quite simple, and somewhat dangerous, on account of the arsenical fumes given off during boiling, ready-made dipping concentrates are put on to the market by several manufacturers, which concentrates simply require to be diluted with water to be ready for use. *Smearing* the animals with crude kerosene oils is used largely in some of the American States instead of dipping.

Fumigation.—The destruction of all classes of insects by fumigation has become very general, and more particularly the treatment with **Hydrocyanic acid gas** (prussic acid). The trees, shrubs, plants, or fruit in cases, to be treated, are covered with a gastight sheet or tent, or are placed into an airtight room, which space is then filled with the highly poisonous fumes of hydrocyanic acid, generated by allowing dilute sulphuric acid to act on potassium or sodium cyanide. The treatment of trees should be carried out at night or on dull cloudy days, and the leaves and fruit should be fairly dry. If the amount of gas generated is too great, young shoots of the trees will be injured. The gas is allowed to act from fifteen to forty-five minutes, according to the size of the trees. For a space of 1,000 cubic feet 4 oz. of potassium cyanide (98 per cent.), 4 fluid oz. of strong sulphuric acid (oil of vitriol), and 12 fluid oz. of water are required. The water is poured first into an earthenware dish (or lead-lined wooden box), and the sulphuric acid slowly and cautiously added, finally the cyanide, previously broken into lumps (of about $\frac{1}{2}$-oz. size), is thrown into the dish. The gas is generated very rapidly, and the operator must take great care not to breathe when adding the cyanide.

This fumigation is also used for the destruction of all kinds of vermin, cockroaches, silver fish, moths, bugs, &c., in houses, railway carriages, ships, flour mills, and other buildings, but the gas is generated about twice as strong. For every 1,000 cubic feet of space use 9 oz. of cyanide, 12 fluid oz. of sulphuric acid, and $1\frac{1}{2}$ pint of water. Only the best cyanide, containing 98 per cent. of KCN or NaCN, should be used. Sulphuric acid is the ordinary strong commercial acid of 1·83 specific gravity. The gas should be generated in earthenware or china vessels, or in wooden tubs, or best in lead-lined boxes. It will be found most convenient to use a 3-gallon vessel for about 3 lb. of cyanide, 4 pints of sulphuric acid, and 6 to 8 pints of water. This quantity is the most convenient to work with, and should not be exceeded; and if the room is too large use two or more charges, so arranged that the cyanide is dropped into the different vessels simultaneously. Fumigate on a calm quiet day. Make the building or rooms as gastight as possible, closing all cracks and openings, which is easily done by pasting papers on the outside over the openings. All machines, boxes, cupboards, elevators, &c., ought to be opened, and all unnecessary material removed and burned before the chemicals are used. A door or some window should be so arranged as to be easily opened from the outside, to allow the gas to escape after the fumigation is finished. If several rooms on different floors have to be fumigated, shut each room or floor off from the others, and always start operations on the top floor. Allow for a ready escape

of the operator. Let the gas act in the room or building as long as convenient, at least from twelve to twenty-four hours. Open the building, and allow the air to enter at least one hour before anybody is permitted to enter the building. In very close and badly ventilated rooms and airtight enclosures, a longer time may be required to get rid of all the poisonous gas, and no room should be entered if the peach-like odour of the gas is very pronounced.

Carbon bisulphide is also largely used as a fumigating agent, and is particularly useful for the destruction of root insects, like phylloxera of grape vines, and the grubs in sugar-cane stools, in which cases the fluid has to be injected into the ground. This chemical is also very extensively used for the destruction of insects living in grain, like weevils, &c., which are simply enclosed in airtight receptacles, like ship tanks, iron drums, &c., to which, after filling them with the grain, some carbon bisulphide, at the rate of 1 fluid oz. for every 20 gallons or 125 cubic feet of space, is added. The liquid is very volatile and highly inflammable, and, therefore, the greatest care has to be taken that no fire of any form comes near it.

If the bisulphide of carbon is of poor quality, if it is used in excess or too frequently, the germinating power of the seeds may be injured, which also happens if the vessels in which the seeds are stored are kept absolutely airtight for any very long period. The disagreeable odour of the grain treated disappears very quickly on exposure to the air.

Benzene and gasolene may also be used in a similar manner, but they do not act quite so powerful as carbon bisulphide.

A very large number of plant diseases are caused by various **fungi**, and for the destruction of these **fungicides** have to be used—chemicals which are generally plant poisons, but are used in such strength only so as to kill the lower forms of vegetable life, but not the higher plants.

Various *mineral salts*, chiefly copper salts, are used as fungicides, and the principal preparations are copper sulphate, Bordeaux mixture, and Eau Céleste.

Copper sulphate is used as a dressing of seed wheat for the prevention of the fungoid diseases—rust, smut, and bunt. The seeds are thoroughly moistened, about twenty-four hours before sowing, with a solution of 1 lb. of copper sulphate in 2 gallons of water.

Bordeaux mixture is the most important fungicide; its active ingredient is copper hydroxide $Cu(OH)_2$, which is obtained by adding milk of lime to a solution of copper sulphate. The solution can be used much stronger (double the strength) in winter than in summer. It is prepared as follows for summer dressing:—

(*a*) 6 lb. of copper sulphate are dissolved in 20 gallons of water in a cask, which is easily done by suspending the copper sulphate enclosed in a coarse sack near the surface of the water.

(*b*) 4 lb. of good fresh quicklime are slaked in another tub by pouring about 3 to 4 pints of water over it. When all the lime has been well slaked, 20 gallons of water are added, stirring well to form a thin milk of lime. This milk of lime must be strained through a fairly fine sieve or through coarse bagging. If much refuse of gravel and stones is left, more lime may have to be used, up to 6 or 7 lb.

(*c*) The milk of lime and the copper solution are poured simultaneously into a large barrel. This manner of mixing is of importance, as otherwise the proper formation of copper hydroxide would not take place. The copper must not be in excess in the finished liquid, which is easily ascertained by plunging a clean knife blade into the mixture, which should remain untarnished; an excess of copper is indicated by copper being deposited on the blade, and in this case more milk of lime has to be added, as otherwise the solution would have a corrosive action on the foliage.

In this strength the mixture may be used for melanose, black spot of citrus fruits, and various other fungi attacking branches and stems of such trees. It

is also used for many diseases affecting grape vines, and as a preventive against potato blight, by spraying the potato plants several times with a somewhat weaker solution (4 lb. copper sulphate, 4 lb. of lime to 50 gallons of water).

Eau Céleste is the well-known deep-blue solution formed by the addition of an excess of ammonia to a copper sulphate solution.

Ammoniacal copper carbonate is made by dissolving copper carbonate in ammonia; this and the former preparation act very similarly to Bordeaux mixture.

Ferrous sulphate (green vitriol, copperas) is also used as a fungicide, more particularly as a preventive against black spot or anthracnose of grape vines. Strong solutions, containing from 4 to 8 lb. of the salt per gallon of water, are used. The wash is very much improved by the addition of about 1 to 3 per cent. of sulphuric acid. As a preventive, the solution must be applied towards the end of winter, before the buds swell.

Sulphuric acid by itself as a 10 per cent. solution is used for the same purpose, and it is prepared by adding ¾-pint of strong commercial sulphuric acid slowly and carefully to 1 gallon of water. If the disease of anthracnose is very prevalent in the district, the winter dressing with either of last two solutions must be followed by spraying with Bordeaux mixture before the blossoms open.

Sulphur. in the form of dry fine powder (flowers of sulphur), is useful as a fungicide, particularly for mildew on roses and other plants.

Sulphur and lime wash is frequently used as an excellent paint for the trunks and main branches of trees, and it is prepared by boiling 2 lb. of sulphur and 1 lb. of stone lime (quicklime) with 2 gallons of water for 1½ hour, then adding 3 lb. more lime, and boiling for half an hour more. The original volume of 2 gallons is made up with water, and some fine flour or fine clay is added to make the whole into a consistency of thin paint.

Potassium sulphide (liver of sulphur, postassium sulphuret) is used as a spray in solution of ¼ to 1 oz. to the gallon of water for mildew on roses, smut, and various leaf blights and scabs.

Formaldehyde is largely used for the prevention of smut in oats and bunt of wheat, by soaking the seeds for two hours in a solution containing 1 lb. of **formaline** (a 40 per cent. formaldehyde solution) in 50 gallons of water. The solution should not be used much stronger, as the germinating powers of the seeds may be destroyed.

Mercuric chloride, corrosive sublimate, is one of the most powerful fungicides, and is extremely poisonous. For the treatment of seed wheat and other seeds a solution of 1 lb. in 50 gallons of water is used.

Nearly all the fungicides enumerated are plant poisons, and when used stronger than recommended will kill all vegetation, and may, therefore, be used for the **destruction of weeds.** The simplest and quickest weed-killer is a solution of **arsenite of soda,** applied in a strength of at least 1 per cent. solution, which is easily prepared as follows:—

2 lb. of caustic soda (95 to 98 per cent.) are intimately mixed with 4 lb. of white arsenic, and 1 gallon of water is added very gradually to the mixture. Great heat is evolved, and the water will boil of its own accord. The arsenic should be all dissolved on stirring the mixture, but, if not, a further heating to boiling point for ten to fifteen minutes may be necessary. This strong solution is, before being used as a spray, made up with water to 40 gallons.

Any of the commercial dip concentrates may also be used as weed-killers, by diluting them with only one-fifth of the volume of water recommended for the preparation of dipping fluids. For instance, Queensland cattle dip concentrate is made up by using 1 gallon of the concentrate to 30 gallons of water for the use as weed-killer; whereas, for the purpose of killing ticks, the concentrates has to be diluted with 160 parts of water; similarly, of royal dip 1 gallon is

diluted with 40 gallons of water; and Alderson's dip, 1 part with 60 parts of water, when they are to be used for the destruction of weeds.

The arsenical solution may be successfully used for the destruction of grass and weeds on walks and courtyards, for the eradication of prickly pear, bracken, and undergrowth. Care must be taken that cattle are kept away from the places where the solution has been applied.

For the destruction of weeds on walks, a strong **brine solution,** applied hot, may also be used, and a strong solution of **sulphuric acid,** 1 part to 15 parts of water, will kill grass and weeds.

QUESTIONS TO THE TWENTY-THIRD LESSON.

1. Which substances are principally used as insecticides and as fungicides?
2. What is of importance in the composition of all arsenical preparations used as sprays to kill insects?
3. Into what classes may insecticides be divided in accordance with their use?
4. How may parasites and insects on animals be destroyed?
5. Describe the fumigation of trees with hydrocyanic acid gas, and what precautions have to be observed in the operation.
6. What chemical may be used for the destruction of insects and grubs living on the roots of plants?
7. What is the cause of most plant diseases?
8. How is Bordeaux mixture prepared?
9. How must seed wheat be treated to prevent rust and smut?
10. How have grape vines to be treated to prevent anthracnose?
11. What chemicals can be successfully used for the destruction of weeds?
12. How is a good kerosene emulsion prepared?

Statistics.

COMMONWEALTH METEOROLOGY.

RAINFALL OF QUEENSLAND.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1907.									1908.			
	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.
North.													
Bowen	0·39	3·46	2·87	Nil	1·28	0·51	0·06	3·71	6·39	10·14	5·63	9·46	3·73
Cairns	3·35	8 65	4·45	0·12	0·39	1·35	0·68	5·35	28·33	27·02	8·03	20 60	5·99
Geraldton	6·08	21·91	8·54	2·39	4 66	1·36	1·42	6·45	33·82	44·39	13·27	39·00	14·23
Herberton	0·90	1·57	2·71	Nil	0·11	0·12	0·17	3·41	9 57	9·29	5·02	8·92	1·40
Hughenden	0·16	1·34	0·95	1·16	Nil	Nil	1·66	0·63	7·75	0·98	5·18	6·91	0·30
Kamerunga State Nurs.	2·80	9·33	5·29	0·13	1·15	1·19	0·53	2·76	29·82	...	7·47	...	
Mackay	1·58	*6·09	5·04	0·27	0·25	0·12	0·12	5·76	9·70	9·28	3·83	17·43	14·82
Rockhampton	0·44	0·94	4·16	0·84	0·47	Nil	0·47	3·72	4·42	3·84	9·64	9·77	2·62
Townsville	1·03	3·11	2·38	Nil	0·07	0·14	0·03	2·82	24·26	12·21	6·69	9·03	0·38
South.													
Biggenden State Farm	0·34	4·02	5·24	1·51	0·96	0·24	1·99	2·50	5·55	...	9·82	...	2·97
Brisbane	0·45	4·75	2·91	0·39	0·79	0·10	1·37	4·25	3·21	2·80	8·43	18·19	2·45
Bundaberg	0·38	3·08	4·49	0·87	0·43	Nil	1·70	2·90	2·99	4·77	2·82	7·35	4·13
Dalby	0·20	2·26	2·35	0·87	0·71	0·15	0·69	5·18	1·44	0·17	4·88	7·61	0·11
Esk	0·22	5·42	2·66	0·54	0·81	0·57	0·50	3·76	3·72	2·61	10·06	17·04	2·83
Gatton Agric. College	Nil	2·80	1·85	0·54	0·56	0·15	0·71	3·01	4·55	...	3·38	10·74	...
Gindie State Farm ...	Nil	Nil	2·29	1·58	0·10	0·16	0·61	1·57	4·42	0·20	7·17	...	...
Gympie	1·12	3·84	3·77	0·80	0·17	0·47	1·20	3·05	5·49	6·26	11·77	80·8	1·87
Ipswich	0·12	3·43	2·22	0·30	0·43	0·05	0·78	4·45	3·40	1·32	6·63	13·77	2·71
Maryborough	1·25	3·21	6·05	0·64	0·93	0·25	2·74	3·49	5·81	5·62	8·07	11·40	2·52
Roma	0·42	0·27	2·47	1·03	0·42	0·04	1·04	3·70	2·51	0·01	6·38	2·51	0·22
Tewantin	1·87	7·16	7·61	1·48	0·95	0·55	1·05	3·12	7·36	10·42	12·47	14·39	7·59
Warwick	0·51	1·58	1·27	1·16	1·37	0·01	1·37	3·25	3·13	0·76	4·52	6·65	1·40
Westbrook State Farm	0·02	2·53	2·53	1·04	1·78	Nil	1·08	4·76	3·23	...	...	...	...
Yandina	...	4·83	6·98	1·15	0·68	0·80	1·44	2·87	3·05	...	...	16·62	5·45

NOTE.—The rainfall data in this table are compiled from telegraphic reports, and must be considered approximate only.

GEORGE G. BOND,
Divisional Officer.

Vegetable Pathology.

"BLACK SPOT" DISEASE OF THE GRAPE VINE AND ITS TREATMENT.

By H. TRYON, Entomologist and Vegetable Pathologist.

The disease of the vine known in Australia as Black Spot, and originally identified by the writer with the *Anthracnose* (French) and *Schwarze Brenner* (German) of European vignerons (*vid.* Tryon, H.—Insect and Fungus Pests, pages 165-8, Brisbane, 1889), is, as was formerly pointed out, due to the attacks on the living tissue of either wood, leaf, tendril, flower stalk, or fruit of a minute parasitic fungus, technically designated *Glœosporium ampelophagum* (or *Sphaceloma ampelinum*).

The external features as well as the character of the injuries connected with "Black Spot" or "Anthracnose" are too well known to need description here, and the minute fungus organism that occasions it is so little patent to observation that further reference to it may be omitted after stating that the spores or seeds that it sheds, and whose presence constitutes the dull reddish grey centres of the "spots," are so small that it would require nearly 500 placed end on and touching one another to cover a single inch of extent.

The treatment of this malady is in great part a preventive one, and in its details has reference to the following facts relating to the dissemination of the latter:—

1. Its first introduction into a district, or even into a vineyard, is almost always effected through the medium of cuttings which, if they do not exhibit the characteristic markings that it has occasioned, at least may harbour the fungus germs (spores).

2. Its continuance in a vineyard from one season to another is dependent upon the persistence of the fungus parasite in a living condition, and in either its seed-bearing or vegetable condition, on or closely within the surface of the ripened wood.

Its virulence as a disease is dependent upon successive infection of one part after another of the growing grape vine as spring and summer proceed, its onset and progress being favoured by humid conditions and a variety of grape vine especially susceptible to its attack. Whence it happens that the disease exists permanently in the coastal districts of the State, whilst in more western localities only occasionally, as a seriously injurious malady; and, under both conditions, certain kinds of grape vine escape its attacks.

Measures of prevention may accordingly be divided into such as deal with the—

1. Disinfection of cuttings;
2. Winter treatment of pruned stocks;
3. Summer treatment of growing plants; and
4. Choice in planting of little susceptible varieties.

1.—TREATMENT OF CUTTINGS.

(*a*) These, when planting is contemplated, should be procured from a place where black spot disease or Anthracnose has not occurred during the past season, or at least from vines that have not been the object of its attack.

(*b*) If, when received, they exhibit the peculiar brand-like marks that are characteristic of the presence of the disease, they should not be used for planting, but rather be burnt forthwith; and

(*c*) In other cases they should be disinfected to destroy germs possibly adherent to them. This may be accomplished by steeping them in a carbolic

acid bath (2 oz. in 4 gallons—1 kerosene tin full—of water) or in a potassium sulphide one (4 oz. in the same quantity of water) for from 10 to 15 minutes. In the latter case, a wooden vessel—cask, for instance—should be employed.

2.—WINTER TREATMENT OF VINE STOCKS.

This treatment should take place after the vines have been pruned, and *whilst the buds are quite dormant*, no *growth* as yet being evident. It should consist in the following procedures:—

(*a*) The prunings to be removed and burned, and the resulting ashes restored to the plants.

(*b*) The stems to be rubbed by the hand, enclosed in a coarse glove—made of bagging or some such substance—so as to remove all loose bark (some purveyors of gardeners' requisites stock a special glove for this purpose).

(*c*) The whole of the parts above ground to be painted or mopped with commercial sulphuric acid and water of 10 per cent. strength—*i.e.*, with a mixture composed of 1 lb. of acid in 10 lb. (1 gallon) of water. This dressing must be made and conveyed in a wooden, earthenware, or enamelled vessel, since metal receptacles would be corroded by it unless coated with anti-acid paint. With regard to adjusting the proportion of acid and water, it has been pointed out that, as a reputed quart wine or whisky bottle holds $\frac{1}{6}$-gallon—*i.e.*, 3 lb.— of acid, a third of its contents will be the measure of acid required for every gallon of water.

In mixing the acid and water, the former must be gradually added to the water, and not the water to it, otherwise spurting, with consequent injury to the person, may result.

The application may be made with rather a large-size brush, composed of bristles or horse hair, or with a rag mop, the handle in each case being fairly long. Insomuch as this acid application is destructive to clothing if shed upon it, and is also "rough on" the skin, care should be taken to avoid splashing, and the operator should be clad in old garments whose injury is not a consideration.

In France a special knapsack spray pump is employed for this, and an equally corrosive winter dressing.

Going over, in the manner described, one or two vines of average dimensions with simple water will afford an insight into the quantity of sulphuric acid required for treating an entire vineyard or any definite portion thereof.

When first making known to Australian vignerons, twenty years since, the nature, cause, and mode of treatment of Grape Vine Black Spot Disease, the writer recommended the use of a strong acid sulphate of iron solution in lieu of sulphuric acid and water for this winter application. This is still the most favoured one in France, and is composed of *sulphate of iron*, 50 parts; *water*, 100 parts; and *concentrated sulphuric acid*, 1 part. Unless, however, the climate be a moist one, some danger to the vine may result from its application.

SUMMER TREATMENT.

Notwithstanding the procedure above described has been carried out, some living spores of the Black Spot fungus may survive in a vineyard to cause the infection of the early growth, or this may be effected through access to it of wind-borne spores derived from untreated vines elsewhere. Accordingly, the winter treatment should be followed up by a spring and summer one. This consists in spraying the vines with Bordeaux mixture (copper sulphate or bluestone, 6 lb.; lime, 8 lb.; water, 40 gallons) or soda Bordeaux mixture (in which soda in equal amount is substituted for lime). The preparation of Bordeaux mixture has been so often described that it need not be repeated here, but directions for its manufacture can be furnished on application. It may, however, be pointed out that, as soon as the first signs of "Black Spot" are evinced,

by the appearance of dark corroded markings on the young growth, its application should be commenced. Moreover, since this fungicide only protects the parts to which it adheres, the application should be renewed every two or three weeks as additional growth is produced or removal through rain has been effected. It requires to be administered by means of a spray pump with atomising nozzle attached to the delivery tube, in the form of a fine mist. A little soapy water added to the mixture will promote both the spreading and adherence of the tiny droplets. Freshly prepared Bordeaux mixture always produces better results than such as has been held over from an earlier application and is accordingly "stale."

Insomuch as has been remarked, the summer treatment described involves the use of a spray pump, and this may not always be available. A dry application of sulphur or of sulphur and lime may be substituted for it, but with less efficaciousness. This is applied in the ordinary way for sulphuring grape vines for Oidium or Powdery Mildew. The sulphur should be very finely ground (flower sulphur), or, preferably, of the kind known as flowers of sulphur, and in either case should be acid to the taste. The latter form is the more costly, but since it is the bulkier, weight for weight, its use involves little more monetary outlay than does that of ground sulphur. The lime should be well air-slaked, to prevent any damage to the coming crop through its caustic action, although, except in the case of flowers and verv small berries, injury from it is scarcely to be anticipated. For the first application sulphur alone may be used, and to this, for subsequent ones, the lime may be added till it constitutes three-fifths or more of the bulk of the mixture.

Reference has been made to a special susceptibility to Black Spot disease manifested by particular vines. It has, however, been found that, even in the Brisbane district where Anthracnose is constantly prevalent, these vines can be grown successfully, and made to produce good sound crops, by careful resort to the winter and summer treatments alluded to. This is a consideration of some importance, since it also happens that the more susceptible varieties are those that generally produce the most esteemed and most valuable fruit. I have ever felt proud of the day when, through my investigations, both the nature of and remedy for this serious vine disease were first made known to the Australian vigneron in 1889.

EARACHE AND ITS CURE.

"I am afraid I have greatly interfered with my own practice," said a celebrated aurist, "by giving the following advice to many of my friends:—At the first symptom of earache, let the patient lie on the bed with the painful ear uppermost. Fold a thick towel, and tuck it around the neck; then, with a teaspoon, fill the ear with warm water. Continue doing this for fifteen or twenty minutes; the water will fill the ear orifice and flow over on the towel. Afterwards, turn over the head, let the water run out, and plug the ear with warm glycerine and cotton. This may be done every hour until relief is obtained. It is an almost invariable cure, and has saved many cases of acute inflammation. The water should be quite warm, but not too hot."

Animal Pathology.

TICK, REDWATER, OR TEXAS FEVER IN CATTLE.

The following report on tick fever was written, at the request of Sir Horace Tozer, K.C.M.G., Agent-General for Queensland, by Professor Robert Wallace, Professor of Agriculture and Rural Economy in Edinburgh University:—

Tick fever, probably best known by the misleading name of Texas fever, has a substantial foothold on all the great continents of the world. A few of its numerous names are—splenic, tick, Spanish, and southern cattle fever; murrain in the United States; "tristeza" in the Spanish countries of South America; "ranilla" in Mexico; acclimatisation fever in Cuba; and redwater fever in Australia and South Africa. A variety is also known in South Africa as East Coast fever. In the States this disease was known in 1814 to be produced among northern cattle after they had mixed with cattle from certain districts of Carolina. A peculiarity of the fever is that the animals which indirectly spread the infection "are apparently in good health, while those that sicken and die from it do not, as a rule, infect others." Known for centuries in the old world, it has within a few years extended to new areas—notably in Australia, in Africa, and in South America—and in each instance in a southern direction from the warm, humid regions of the tropics into the intermediate zone south of the equator and north of the cold or dry region, where the cattle tick which carries the parasitic cause of the disease cannot maintain its existence.*

Texas, an important cattle-breeding and exporting State, is by far the largest of the southern States of America which are within the infected area. Its serious annual loss (although less by fever directly than by the dislocation of the cattle industry), the retardations to improvement in cattle-breeding, and the restrictions necessary in the interest of healthy cattle outside, attracted the attention of the Agricultural Department at Washington. An exhaustive inquiry into the nature of the disease and the life history of the tick was instituted through the Bureau of Animal Industry of the department in 1888, and its results, with those of State investigations which followed, have been a trustworthy guide to all deeply interested in other parts of the world. Experiments have been carried out in other countries; but they have in all essential particulars merely confirmed the American results, with slight variations due to local circumstances. The discovery of the minute mico-parasite, *Piroplasma bigeminum* or *P. bovis*, the cause of the specific fever, was made in 1889 by Dr. Theobald Smith, an expert of the Bureau of Animal Industry; and the same year Dr. F. L. Kilborne discovered that the cattle tick,† *Boophilus annulatus* (Stiles and Hassall), (*Ixodes bovis* (Riley), *Boophilus bovis* (Curtice), are synonyms) was the intermediate host of *bigeminum*, and the only natural carrier of this the cause of the disease.‡

* "In Australia, Texas fever was first observed about 1885 in the northern part of the continent. . . . . In South Africa it was first introduced about 1870. . . . Lignières reports Texas fever in Argentine in 1890; it was reported from the Philippine Islands in 1903; and Lingard states that it has been recognised in India since 1871."—Mayo.

† "This tick is found principally on cattle, less frequently on horses, mules, and asses, and in one case it was found on a deer."—Cary.

‡ See Bulletin No. 1 of the Bureau of Animal Industry, U.S. Department of Agriculture, "Investigations into the Nature, Causation, and Prevention of Texas or Southern Cattle Fever," by T. Smith and F. L. Kilborne, published at Washington, D.C., 1893.

A list follows of pathogenic ticks and the countries where they are found, kindly supplied by Dr. Geo. H. F. Nuttall, F.R.S., Quick Professor of Biology, Cambridge:—

Carriers of Redwater (*Piroplasma** *bigeminum* or *P. bovis*).—1. *Boophilus annulatus*, North America; 2. *Boophilus australis*, Australia, North and South America, Japan, Africa; 3. *Rhipicephalus decoloratus*, Africa; 4. *Ixodes ricinus*, Europe, North America (always found associated with the disease in Europe, but not demonstrated); 5. *Rhipicephalus capensis*, Africa; 6. *Rhipicephalus evertsi*, Africa. (Koch observed development of Piroplasma in this species.) 7. *Hyalomma ægyptium* (suspected, Koch observed development of Piroplasma in it).

Carriers of Rhodesia or Coast Fever (*Piroplasma parvum*).—1. *Rhipicephalus appendiculatus*, Africa; 2. *Rhipicephalus simus*, Africa; 3. *Boophilus annulatus*, var. *calcaratus* (carries *P. parvum* in Caucasus, Dschunkowski).

Carriers of *Piroplasma canis*.—1. *Hæmaphysalis leachi*, Africa; 2. *Rhipicephalus sanguineus*, South Europe, Africa, India, West Indies, &c. (All over the world.)

Carrier of *Piroplasma ovis*.—(Sheep) *Rhipicephalus bursa*, South Europe, North Africa.

Carrier of *Piroplasma equi*.—(Not known).

Carrier of Heartwater in Goats and Sheep.—*Amblyomma hebræum*, Africa.

Messrs. William Cooper and Nephews, of Berkhamsted, England, who have conducted extensive experiments on tick infestation and its consequences at their estate of Gonubie Park, East London, say:—"Ticks in South Africa cause redwater and Rhodesian fever and heartwater in cattle; heartwater in sheep; biliary fever in horses; piroplasmosis in dogs; and various other diseases. Heartwater is particularly serious, because it attacks both sheep and cattle. In addition, the bont tick (*Amblyomma hebræum*), which conveys heartwater, does not remain on the same host through all its stages as does the ordinary blue or redwater tick (*Rhipicephalus decoloratus*). It is so hardy that no amount of starving—that is, keeping the stock off the land—will cause its disappearance. Sheep in the East London district will not live longer than three or four weeks when affected. Heartwater is very fatal to calves, and some authorities place the death rate as high as 60 per cent. of deaths before the calves are six weeks old."

Inoculation by anti-serum being of no practical value as a preventive of redwater, the first successful blood inoculation experiments were made between 1895-1900 by Drs. M. Francis, V.S., Texas, and J. W. Connaway, V.S., Missouri. The relative immunity obtainable in susceptible cattle (or, in other words, those born and reared on land not infested with *Boophilus annulatus*) has also been secured by the veterinary surgeons of most of the other southern States in which the disease is endemic—*i.e.*, by Drs. C. A. Cary, Alabama; C. F. Dawson, Florida; C. L. Willoughby, Georgia; W. H. Dalrymple, Louisiana; J. C. Roberts, Mississippi; Tait Butler, North Carolina; G. E. Neson, South Carolina. Full details of the results have been published. The loss by death among the first approximately 5,000 animals treated varied considerably at the different centres—from none to 11·5 per cent.—the average being 7·55 per cent. Dr. Nelson S. Mayo, Vice-director and Chief of the Department of Animal Husbandry of the Central Experiment Station of Cuba, also issued, in April, 1907, the results of much useful work in the field of tick fever investigation. (Bulletin No. 6.) †

* First named *Pyrosoma*; also spelt *Pyroplasma*.—R. W.

† To these authorities' publications, as well as to those of the Bureau of Animal Industry at Washington, indebtedness is acknowledged.

The object of inoculation is to introduce the fresh blood of an immune animal containing the disease-producing organisms into the blood of a susceptible animal, and thus occasion a mild attack of fever, not acute enough to cause death, but real enough to bring about the desired result. Young cattle are more likely to recover than old ones, and the operation is best performed when or before they are two years old.

The parasitic micro-organism which is the origin of all the mischief is somewhat similar to those producing malarial fever in man. In Cuba and in

DIAGRAM No. I.

The parasitic micro-organism found in the red corpuscles of the blood of an animal which died of Texas fever. Fig. 1 shows an intra-globular parasite in subcutaneous blood taken a few hours before death—one of a group of organisms which show very marked changes in outline. The sketches of magnified blood corpuscles contain individually a nuclear (?) body, the lower row being taken from fresh cutaneous blood shortly after death.—From the "U.S.A. Report on Texas Fever, 1893."

South America the disease is sometimes designated yellow fever. The organism is a protozoon, which at times "has the power of changing its position and form while under observation." It is generally pear-shaped, and found two together within one red blood corpuscle—the pointed or "stem" ends converging and then occupying about a fourth of the cubic space of the cell. It multiplies very rapidly on gaining admission to the blood of a bovine animal. It is not easily found in the external circulation, but it is numerous in the spleen and in the "blood of the tissues of the heart, liver, and kidneys." In acute cases it rapidly destroys the red blood corpuscles in which it harbours; and, the resulting hæmoglobin, making its escape from the animal's disorganised system, is frequently present in such quantities in the urine that it has given origin to the name Redwater Fever. It is the process of ejecting the cell *débris,* much more than the loss of blood corpuscles, that causes the rise of temperature and the congestion of the affected organs.

Drs. Geo. H. F. Nuttall and G. S. Graham-Smith, writing from the Pathological Laboratory, Cambridge University, on an exhaustive series of their experiments on "Canine Piroplasmosis" in "The Journal of Hygiene" for October, 1906, and again in April, 1897, describe as follows the asexual cycle of development within the peripheral blood of the *Piroplasma canis,* which, being nearly related to the organism producing Texas fever, probably goes through a similar process of development:—*"A free pyriform body which has just left a blood corpuscle enters another corpuscle and soon assumes a round form, usually remaining quiescent for a time. The round body then becomes actively amœboid and grows. After a longer or shorter time it either assumes a pyriform shape, and escapes from the cell to repeat the process, or it divides and gives rise to two or more pyriform bodies, which are for some time joined together by a thin process or processes, but ultimately become separated, escape from the corpuscle, and invade other corpuscles. The invaded corpuscle ruptures and disintegrates after the escape of the parasite." (Diagrams II. and III.)

* Since the foregoing was written, Prof. Nuttall informs us that he has observed the same mode of multiplication in *P. bigeminum.*

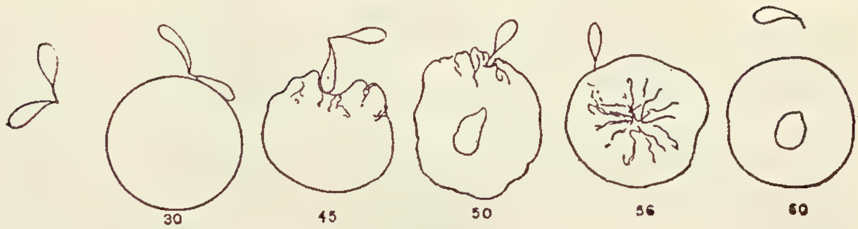


DIAGRAM No. II.

"Serum containing numerous free parasites was obtained from an infected dog shortly before death, and added to a small quantity of normal dog's blood. Shortly after the preparation was made two pyriform parasites, joined by their pointed ends, were noticed swimming free in the fluid between the corpuscles, and frequently altering their relative positions to one another. Fifteen minutes later one of the pair applied itself by its side to the edge of a corpuscle, while the other swung freely (30′). In this condition they remained for fifteen minutes, when the applied parasite rapidly changed its position and indented the corpuscle with its blunt extremity. Very violent movements then occurred, during which the side of the corpuscle was greatly distorted, but after five minutes the parasite passed into the corpuscle (50′), leaving the other with its apex attached to the distorted wall of the corpuscle. Soon afterwards the edge of the corpuscle became well defined, but the surface of the central portion was still disturbed by the movements of the internal parasite (56′). Shortly afterwards all motion ceased, and the corpuscle resumed its normal appearance, but showed a rounded parasite within it. Shortly before this the other parasite became free and swam away. It attacked another corpuscle but did not enter it."

In Fig. 12, Diagram III., the at one time single mass of chromatin has nearly divided, "but the resulting masses are still connected by a thin strand. At this stage a change takes place in the appearance of the strands of chromatin passing down the processes. They lose their definite contour, and become transformed into masses of loose chromatin with a reticular structure." In this no vacuole, which is sometimes observable, is present. "The upper row of figures represents the appearances which are seen when the terminal portions

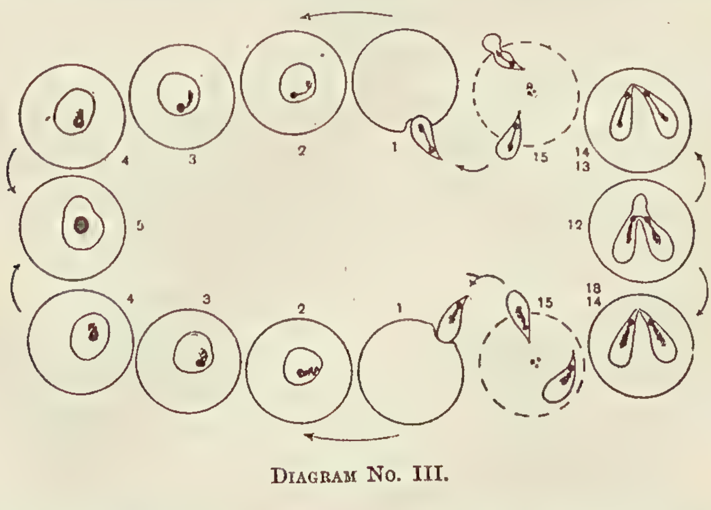


DIAGRAM No. III.

Diagrams II. and III. reproduced by permission of the Cambridge Press from "Canine Piroplasmosis," V. and VI., by G. H. F. Nuttall and G. S. Graham-Smith, in the "Journal of Hygiene," for October, 1906, and April, 1907.

only of the strands of chromatin, which pass down the processes, are changed into reticular masses. In Fig. 14 the completely formed parasites of this type within the corpuscle are represented, and in Fig. 15 the rupture of the corpuscle and the escape of the parasites, one of which is in the hour-glass condition while passing through the corpuscular envelope. Figs. 1, 2, 3, 4, and 5 show the gradual condensation of the chromatin into a single mass after the entry of one of the parasites into a fresh corpuscle. In the lower row of figures the same series of events are represented in parasites without vacuoles, in which the secondary mass of chromatin forms a loose mass closely related to the dense mass."—Nuttall and Graham-Smith, "The Journal of Hygiene," page 260, April, 1907.

The conditions under which the corpuscles are destroyed vary extremely, and, so far, no typical temperature curve has been found. "Often in the acute stage of the fever (in cattle), with a temperature of 105 degrees to 106 degrees Fahr., the red cells show a reduction of only 20 per cent., while, during a later stage pending either death or recovery, a temperature of 101 degrees to 102 degrees is attended by a destruction as high as 75 per cent.; or the reverse may be noticed." In the last stages of the worst of fatal cases, after the temperature has gone down even to subnormal, few organisms remain in the corpuscles; but many are present in the blood plasma, especially of the kidneys. According to Schroeder, "in the ordinary immune cattle there is not over one parasite to several million corpuscles"; but one in fifty is a possible amount in fatal cases.

It has not been observed that any toxic substance is present, and as a result of the work done it is not believed there is one.

The organism is communicated to cattle by the bite of the larval (*Boophilus*) or adult (*Rhipicephalus*) tick, which fixes itself by its mouth-parts to the skin, and swells up to a large size, by sucking the blood of the host. The female is accompanied by one or two relatively small males, which shelter under her. When gorged with blood she loses hold, and drops to the ground in a relatively helpless condition; but she may crawl a short distance to the nearest shelter, where after a few days' rest she begins to lay from 1,500 to 4,000 eggs, a task which she accomplishes in from six to fifteen days, meanwhile becoming wrinkled. She then dies. If conditions be unpropitious, as in winter, the eggs lie dormant till spring; but if favourable, hatching may occur within twelve to thirty days into minute, active six-legged "seed ticks" or "garrapatilla" (Spanish), which, if not able to find their way on to cattle, horses, or mules, "starve to death in one to four months in summer, and one to seven months in winter." To secure a position of vantage, and be ready to cling to the legs of passing animals, seed ticks climb and cluster on the highest points near, as on the stems or leaves of pasture plants. On gaining a foothold they crawl up, by aid of two small hooks at the termination of each limb, to positions of safety before they become attached, usually to the soft and thin-skinned parts, the escutcheon, the udder, inside the thighs, about the roots of the ears and tail, and on the dewlap. This is the stage at which their bite inoculates cattle with the organisms of tick fever, passed on to them by the breeding female through the eggs. In about six days the seed tick molts, and is transformed into a nymph with eight legs. In eight to twelve days more a second shedding of the skin occurs, and immediately after the female becomes pregnant. The male grows little more, but the female swells steadily for from six to twelve days, and finally becomes engorged during the last two or three days before losing her hold. "The shortest time of the life cycle is about thirty-five days in summer and six to eight months in winter" (*see* Plate). Dr. C. A. Cary thus tabulates the life history of the cattle tick in Alabama:—

Plate XXXI.

Cattle Ticks, and the Texas Fever Protozoa They Transmit to Cattle.

1. Larva of Cattle Tick (×25). 2. Same (natural size). 3. Mature Female and Eggs (×2). 4. Hide, showing Cattle Ticks (natural size). 5. Blood Cells (red corpuscles), containing Texas Fever Protozoa ×1000). 6. Male Cattle Tick (×15). 7. Same (natural size). 8. Young Female Cattle Tick (×15). 9. Same (normal size). 10. Various Stages of Cattle Ticks (natural size).—From Louis A. Klein's "On the Methods of Eradicating Cattle Ticks, U.S. Department of Agriculture, 1907."

——	Summer (May to October).	Winter (October to May).
1. Egg-laying time	6 to 15 days	30 to 60 days.
2. Hatching time	12 to 30 days	30 to 210 days.
3. Seed tick may live without getting on cattle	30 to 120 days	30 to 240 days.
4. After attaching to the skin of cattle, females mature and drop off in	15 to 35 days	25 to 60 days.

The plate shows cattle ticks and the Texas fever protozoa they transmit to cattle:—1. Larva of cattle tick (× 25); 2. Same (natural size); 3. Mature female and eggs (× 2); 4. Hides showing cattle ticks (natural size); 5. Blood cells (red corpuscles) containing Texas fever protozoa (× 1,000); 6. Male cattle tick (× 15); 7. Same (natural size); 8. Young female cattle tick (× 15); 9. Same (normal size): 10. Various stages of cattle ticks (natural size).—From Louis A. Klein's "On Methods of Eradicating Cattle Ticks, U.S. Department of Agriculture, 1907."

The height of the tick fever season in North America is the latter half of August and the early part of September. The acute type of the disease occurs at this time, and is generally fatal. "Adult animals, particularly milch cows or fat cattle, nearly all die." A milder and slower non-fatal form appears late in autumn. When it occurs in July or early in August it is very liable to develop into the acute form and terminate fatally.

To prevent the transportation of ticks by cattle from the permanently infected southern States to the northern pastures, regulations are annually made by the Secretary of Agriculture. They define the northern boundary of the affected district, and stipulate "that no cattle shall go out of it except for immedate slaughter, between 1st February and 31st October." The open season to most of the States in which store cattle may be shipped north is between 1st November and 31st January. Danger is then reduced to a minimum, and "cattle become naturally free of ticks every winter in the northern portion of the quarantined area." All cattle have to be inspected and accompanied by a license; and, if they have not been dipped in oil to kill the ticks before starting, they must be shipped in cars marked "southern cattle," to a slaughter house or yard set apart to receive them.

The symptoms may appear after a period of exposure on tick-infested pasture of from thirteen to ninety days. Ticks, often quite small and difficult to locate, will be found on close inspection. With the acute form of the fever the animal suffers from extreme prostration and dullness, stops feeding and ruminating, and, walking with difficulty, falls behind its neighbours and lies down or stands alone, while its ears lop and its head hangs. The temperature rises to 106 degrees and 107 degrees Fahr., from the normal 101 degrees to 103 degrees Fahr. In mild prolonged cases the temperature may not exceed 104 degrees Fahr. Little change in temperature occurs until death or recovery is near. The pulse and respiration are abnormally rapid. Constipation is general, though not invariable, except towards the end of the fever, when also the red colouring matter appears in the urine. "As the end approaches, emaciation becomes very marked, the blood is very thin and watery, and the closing of any wound of the skin by clots is retarded. The animal manifests increasing stupor, and may lie down much of the time. Signs of delirium have been observed." Death occurs most frequently at night, and in from three days to, it may be, several weeks after the onset of the fever. The *post-mortem* examination shows yellow fat and thin watery blood. "The most important changes are noticed in the liver, spleen, kidneys, and bladder, other organs being practically normal." Recovery in perhaps 10 per cent. of the cattle affected in hot weather is extremely slow; and a second mild attack is very liable to occur in autumn. The mild attacks which originate in October and November are associated with so little fever that they easily escape observation. "If, however, the blood corpuscles be counted from time to time, a gradually diminishing number will be found, and after several weeks only about one-fifth or one-sixth of the normal number are present"; and the animal loses weight.

Apart altogether from the fever, "in biting into the skin to connect their sucking organs with the blood supply the ticks set up little areas of inflammation, and when the parasites are numerous the irritation thus produced is a cause of considerable worry. Young animals exposed to excessive tick infestation become stunted, weak, and more liable to succumb to disease; dairy cows give a reduced yield of milk, and beef cattle can only be fattened, if at all, at increased cost."—Klein.

Means are now successfully employed to induce animals liable to be exposed to dangerous infection by being introduced after they are past the very young stage to a tick-infested area, to take the disease in a mild form, and thereby to secure a condition of modified immunity or "a toleration of the parasite, that keeps the animal from suffering an acute attack." "However (says Cary), it is a condition of unstable equilibrium; and a slight environmental change, such as intense heat, severe exertion, adverse change of blood, or certain undetermined factors tending to lower the animal's resistance, or, on the other hand, a slight or considerable increase in the number of the invading organism, suffices to bring on acute and often fatal attacks of the fever. . . . A cow, steer, or ox must have an attack of tick fever once every year or several times every summer, or its immunity is lost within two or more years. Just as a man can have a series of attacks of malaria, so may cattle have a series of attacks of tick fever. It is true that one cow has been known to carry the micro-parasite in her blood for thirteen years; but thousands and thousands of native southern cattle that have had one or more attacks of fever die every year from one severe attack or several attacks in one season."

The credit of the institution of a method of artificial immunisation is due to Dr. M. Francis, and Dr. J. W. Connaway, respectively of Texas and Missouri, the two States which have taken the lead in this branch of the investigations. Cattle of from eight to eighteen months old give most satisfactory results, and that in the cool period of late autumn or early winter months. Subcutaneous injections of a small amount of defibrinated virulent blood freshly taken from an immune tick-carrying animal are given two or three times, at intervals of three weeks; 1 cubic centimetre is the standard dose for an animal one year old, but a beginning may be made with less, and the amount increased each time. In place of 90 per cent. of loss, considerably over 90 per cent. of cattle in good physical condition recover from the relatively milder attack of fever generally induced by artificial inoculation. The blood supply animal should be selected from native stock of about two years old, which has been exposed to tick bite from birth. It has been demonstrated that more uniform and satisfactory results are got by direct artificial inoculation than by allowing a limited number of virulent young ticks to do the work. But when this latter course is adopted, rather than allow a well-bred calf to run on a tick-infested pasture like native cattle, it is safer to keep it in tick-free quarters, and begin by placing on it six young ticks, to be increased in two weeks by six more; and so on till a mild attack of the fever has been induced. "If ticks do not get on a calf when it is very young, the older the animal grows the more severe will be the fever, and the greater the danger of death when ticks do get upon it."—Mayo.

After inoculation the animals should be amply provided with succulent green food to keep the bowels open, and should have salt to lick and clean drinking water within reach all the time. Following the preliminary mild attack of fever, which usually begins about a week after inoculation— although it may occur within five days—and lasts for about ten days, a second rise of temperature may occur between the twenty-fifth and fortieth day after the inoculation. "During the periods of high fever there is a rapid destruction of red blood corpuscles. The normal per cent. of red blood corpuscles is about 45, and this is diminished to 25 or even 20 per cent." If the reaction is very marked, animals are liable to fall away very quickly in condition; and they do not

resume their normal growth or increase rapidly in flesh for four or five months, but after this period there is no noticeable effect." In the following summer inoculated cattle require careful handling and good food, and they should not be permitted to become grossly infested with ticks.

"The micro-parasite of tick fever varies in virulency, and cattle vary in their degree of susceptibility or resistance. Moreover, the resistance or susceptibility of the individual animal varies with the condition of the animal, its age, and its vitality or vigour. A very fat or a very poor animal possesses low resistance; an old animal is less able to throw off the waste products and repair the loss of blood cells than a young one; an animal weak from any cause is also less resistant. Besides, there are individual animals that have a low index of resistance, from some condition of the blood or from some unknown cause. And there are other times when the micro-parasite acquires an increasing virulence. The passing of the parasite through non-immunes, or the frequent and rapid transmission of it through cattle, is said to increase its virulence. This in part accounts for the greater virulence of the parasites and the greater number of deaths in native cattle in the fall. The micro-parasite has passed through two or more generations of ticks, and through the body of one or more animals, without having low temperatures to reduce or to retard its activity."—Cary. It has also been found that "when recently immunised cattle are placed upon a ticky pasture alone, they seem to suffer more severely from tick inoculation than when allowed to run with native animals."—Dalrymple.*

The medical treatment of tick fever involves good nursing; a change to clean pasture; the removal of the ticks. When necessary to sustain strength, a litre of new milk with two fresh eggs beaten up in it every four hours. In cases of great prostration, doses of 10 oz. of brandy, and also oil; Epsom salts to remove constipation when it occurs. To a bullock of 600 or 700 lb. live weight, 30 to 60 grain doses of quinine four times a day may be given for two or three days. Very high temperatures should be relieved by spraying with cold water. Cool fresh water and soft green or some other nourishing cooling food should be within the animal's reach.

Apart from all this, the proper course to follow from the national point of view is to get rid of the ticks altogether. The history of the efforts made in this direction and the full measure of the success attained is concisely recorded in the "Report of the Secretary of Agriculture" (the Hon. James Wilson) for 1907, issued 30th November, which says:—"The progress made in the eradication of the cattle tick which transmits Texas fever demonstrates that the ultimate extermination of this costly pest is entirely practicable if Congress and the State Legislatures will provide the necessary means. The great benefit which will accrue to the cattle industry of the south, and incidentally to the country at large, from the success of this work will abundantly justify the necessary expense. The work of tick eradication was not actually begun until 1st July, 1906; yet, as a result of work done to 31st October, 1907, there have been, or will in the near future be, released from quarantine certain areas in Virginia, North Carolina, Georgia, Tennessee, Arkansas, Oklahama, Texas, and California, amounting to approximately 60,000 square miles; and good headway has been made in still other areas. The work has been pursued in co-operation with State authorities in the States above named and in South Carolina, Alabama, and Louisiana. Complete returns to 31st October last show that during the first ten months of the present calendar year this work has included 2,307,934 inspections and 775,795 disinfections of cattle. Various approved methods for the eradication of ticks have been used, including

* See "Texas Fever: being a General Summary of our Knowledge of the subject to date (October, 1905)" by W. H. Dalrymple, M.R.C.V.S., Agric. Experiment Station of the Louisiana State University, &c.

pasture rotation and dipping, spraying, and hand-dressing with oil and oil-emulsion."

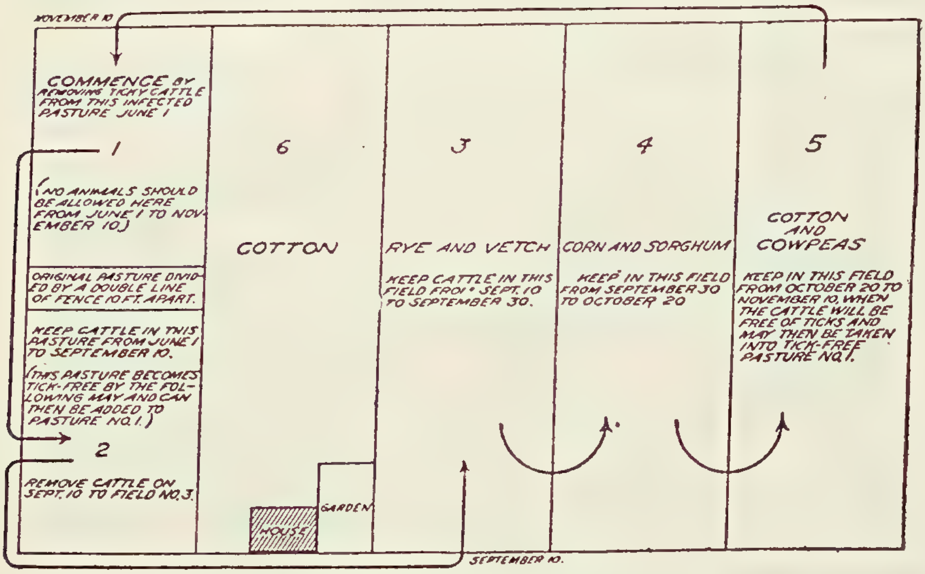


DIAGRAM No. IV.—CLEANING CATTLE AND SOIL OF TICKS BY PASTURE ROTATION.
From "Louis A. Klein's Report on Methods, 1907."

It has long been a practice in different parts of the world where climatic conditions permitted—notably in South Africa, in Australia, and Cuba—to annually burn off the withered grass, and thus to destroy a large number of ticks and their eggs; but the custom is most injurious to the quality of the herbage, and consequently to the stock-carrying capacity of the pasture.

Several successful methods of clearing the land of ticks, and thereby getting rid of the sole cause of the fever, have been devised since the life history of the tick was fully investigated. Different circumstances require the adoption of different methods. Cattle in large numbers have been dipped in a swim bath or tank with many different solutions, but for years with very indifferent success. As the dipping stuff floats on the top of water filling the tank to within 6 to 10 inches of the surface, it was found impossible to get all parts of the skin properly in contact with the effective material; and, moreover, many cattle died. Even when the tank was filled with dip material, to overcome, at increased cost, the difficulty mentioned, cattle were liable to be drowned.

Messrs. William Cooper and Nephews have (February, 1908) favoured us with the subjoined statement of the case for dipping, more especially in regard to their researches in South Africa.

"The plan adopted was as follows:—Having recognised that the starvation of the ticks was impossible, the only way to attack them was while they were on the animals. As the bont tick had three hosts, and the longest period that it is on an ox is probably not more than fourteen or fifteen days, it was decided that all the animals must be dipped every fourteen days in an arsenical dip. The blue tick, which is on a minimum of six weeks, was readily attacked, but the bont tick has proved more obstinate, not only because some may escape dipping, but because it is more difficult to kill. In order to collect the ticks as rapidly as possible, the farm was heavily stocked with oxen for fattening. These were allowed to roam about the veld, and picked up the ticks, and then the cattle were dipped before the ticks had time to develop or breed. It was hoped that by this method the farm would have been quite cleared of ticks in two or three years. This has not quite succeeded, but the

number of ticks now is very small, and it is hoped that in another year the farm will be quite clean.

"With regard to the effect of this continual dipping, it has been found that young animals suffer less than old oxen, but that the continual dipping has a tendency to delay their fattening and to make the animals 'soft.' If care be taken that the animals are never dipped when they are hot, and are never driven after the dipping until they are quite dry, most of the bad effects can be avoided. Probably the farm would have been clean much earlier if a perfect cattle dip had been in existence. Every cattle dip on the market or that has been recommended was tried, but none of them could be relied upon to kill more than 50 per cent. of the female bont ticks. A cattle dip has, however, been discovered which kills 100 per cent. of the ticks without injury to the cattle, and with this dip further experiments will be carried on. This dip will shortly be placed upon the market under the name of 'Tixol.' While studying the practical questions of the problem, the scientific have not been neglected, and a large amount of work has been carried out upon the anatomy and life history of the ticks in the Cooper Research Laboratories at Watford and Berkhamsted, upon material supplied from Gonubie Park and the other estates belonging to the firm in the Transvaal and Rhodesia."

The problem of applying a wash of safe strength effectively to all parts of the skin of a tick-infested animal appears to have been solved in January, 1905, by the exhibition at Denver stockyards of a spraying machine, invented by Dr. Gorham T. Seabury, State Veterinary for Wyoming. Details may be had from the Seabury Live Stock Spraying Machine and Manufacturing Company, 514 Equitable Buildings, Denver, Colorado, U.S.A.

The machine is a tube placed at the outlet of an ordinary branding chute, wide enough to let cattle or horses pass through it. Forty openings in various parts of the tube permit of forty jets, forming sheets or fans of spraying solution, being forced at every possible angle under a pressure of 30 or 40 lb., so that the liquid gets under the hair and effectively soaks all parts of the body and kills all surface parasites. The most simple and effective dressing employed at first was crude petroleum oil from certain wells in Texas, and known as Beaumont crude oil. This contains from 40 to 50 per cent. of oils boiling below 300 degrees C., and from 1 to 1·5 per cent. of sulphur; but Dr. Klein says that "West Virginia black oil," obtained from wells in West Virginia and Kentucky, gives results equally as good as Texas oil. The proportion to use is 1 part of oil to 4 parts of water, kept thoroughly incorporated by a mechanical mixer with which the machine is equipped. An oil preparation called "Tickicide" can be got in barrels at about 3d. per gallon from the Gulf Refining Company, Tarupa, Florida. The number of animals that can be treated depends upon the rate at which they pass through the machine. Wild cattle rush through more quickly than those accustomed to being handled. Over 4,000 have passed through in seven hours. The use of a satisfactory emulsion of crude oil is advocated by Circular No. 89 of the Bureau of Animal Industry, by Dr. T. M. Price, of the Biochemic Division.

To make an emulsion that will only separate after standing for some considerable time and have a creamy layer that will easily mix again by energetic agitation, 2 gallons of crude petroleum is mixed with ½-gallon of soft water that has been boiled with ½-lb. of laundry or hard soap. The emulsion mixed by passing through the spray pump is subsequently diluted, just before using, with 7½ gallons of water. After spraying with crude petroleum, cattle have been known to remain on tick-infested ground for twenty-one days without becoming reinfested.

A good substitute, when these oils are not available, is 1 lb. of flowers of sulphur melted in a gallon of crude cotton-seed oil, and mixed with ½-gallon of kerosene. While sulphur is a useful ingredient in a dressing for the skin, it is of no value given internally as a means for tick prevention.

As oil is liable to close the pores of the skin, the animals, especially if weak or newly imported, suffer from the heat in very warm weather, and require to be provided with shade. But it should be remembered that:— "Shade and a little moisture in hot weather favours the hatching of eggs and the longevity of the seed tick. Dry and hot sunny places are hard on ticks—in fact, seed ticks cannot live one month in such places.' Ticks do do not die in great numbers even after effective dipping before the third day, although their development is stopped. They are usually all dead by the sixth day.

Apart from the loss due to fever, the loss of condition in eild cattle, and the diminution in the flow of milk from the irritation caused by the puncturing of the skin, and especially from the loss of blood, when ticks are numerous, would be a sufficient reason for stamping out the pest. "The excessive tax," says Morgan, "of gross infestation of ticks is not only shown by the great loss of flesh of animals attacked, but in the slower development of ticks on animals intensely infested." The poorest and most unthrifty cattle in a herd usually carry most ticks. A few cattle "seem to possess a natural immunity to ticks," and remain almost if not quite free, while their neighbours in the herd are badly attacked. In Cuba, cattle with Zebu blood "appear to have fewer ticks

DIAGRAM V.—GREAT CATTLE TICK (AMBLYOMMA HEBRÆUM).

Male, life size, and magnified; outline figure showing size of inflated female.—From the Author's "Farming Industries of Cape Colony."

than common cattle." There the life cycle of "the tick, under normal conditions, is about two and a-half months, or five generations in one year."

The following conclusions by Dr. Louis A. Klein, of South Carolina, based on the life history of the tick, are published 20th May, 1907, in Circular No. 110 of the Bureau of Animal Industry:—

(1.) "If cattle, horses, or mules are placed in a tick-infested pasture, the seed ticks will attach themselves to these animals and grow. [This is so, though horses, asses, and their crosses do not contract Texas fever.]

(2.) "If cattle, horses, and mules are kept out of a tick-infested pasture, the seed ticks will perish of starvation within three or four months after they are hatched. They will not attach themselves to other animals; the ticks usually found on dogs, rabbits, &c., are not cattle ticks, but belong to other species."

(3.) "The time required for the female ticks to deposit eggs and for the eggs to hatch is rarely less than three weeks, and may extend over six or eight weeks, and eggs deposited late in the fall may not hatch until the following spring."

(4.) "In the warmer seasons of the year, twenty to forty days after becoming attached to cattle, the female ticks become mature, drop to the ground, and deposit eggs."

(5.) "Each female tick destroyed will cut off succeeding generations of millions of seed ticks."

Dr. H. A. Morgan, of Tennessee, says, "in freeing pastures from ticks, it is important to keep cattle, horses, and mules out of them for at least four months in summer and nine in fall, winter, and spring." Dr. Butler has had great success in North Carolina by removing "all cattle, horses, and mules from the pasture on 10th September, and keeping them out until 10th April or 1st May"—a period of the year when farm work is not pressing and pastures are of least value. Cattle can be freed from ticks by keeping them in rotation in three fields free from the pest, for a period of twenty days in each.* Ticks that fall off within that time cannot produce seed ticks quickly enough to reinfest the cattle before these move on to clean ground. If placed on land on which cattle, horses, and mules have been excluded for the necessary period, cattle remain clean. Two wire fences, placed 10 feet apart, are needed to divide infested from free land, and prevent ticks crawling from the one to the other; and drainage should never pass from infested to free land, as seed ticks are difficult to drown, and are easily carried by surface water.

Having begun the destruction of the tick, it is necessary to complete it; for reinfestation after a period of freedom would lead to serious mortality among the cattle.

Small numbers of cattle—household milch cows, for example—can be cleaned by dressing with crude oil rubbed well into the bottom of the hair, and closely examining for ticks every week. A second dressing, probably four weeks after the first, and a third about three weeks later, will generally eradicate them.

Another smear for rubbing on, advocated by the Bureau, is a mixture of 1 gallon of kerosene, 1 gallon of cotton-seed oil, 1 lb. of sulphur, and 2 lb. of pine tar.

The parts most likely to need attention are "the regions between the foreleg and the brisket, the inner side of the flank, the internal surface of the ears, the depression at either side of the root of the tail, and the end of the tail." Two men, working one on each side, can dress five or six cattle an hour, and use about ¾-gallon of oil for each animal.

In Cuba three common wild birds (the "toti," *Scolecophagus atroviolaceus*, the "mayito," *Agelaius humeralis*, and the "judio," *Crotophaga ani*), besides common barndoor fowls, destroy many adult female ticks, and flocks of Rhinoceros birds or "rhenoster vogels" (*Buphaga erythrorhyncha*) in South Africa visit antelopes and cattle, and clear them of ticks and other skin parasites.

TICK FEVER.

IS GENERAL IMMUNITY ATTAINABLE?

There is, says the "Rockhampton Bulletin," probably no matter affecting stock-owners, concerning which so many contradictory opinions are advanced, and so much conflicting evidence presented, as the question of the efficacy or otherwise of inoculation for the disease variously known as Texas fever, tick fever, and redwater. It is generally admitted that cattle bred on tick-infested country acquire a high degree of immunity; that they are, in fact, practically safe from the disease so long as they are not brought in contact with fresh ticks, either through being travelled or through the introduction of strange, tick-infested cattle among them. There actual knowledge ends. Move the supposed immune cattle 20 miles from their own pasturage, and heavy loss may result. On the other hand, it is equally possible that they may be travelled 500 miles without showing fever at all. Split the mob at the end of the trip, placing half on one run and half on another—we are speaking, of course, of infested country—and of the section turned out on "A" you may lose 40 per cent., while the mob depastured on "B" shows not a sign of the disease.

* See also Diagram IV.

The annual draft from a certain station in this district was for three successive years removed to another station some 60 miles to the north-east without the loss of a beast from fever. The fourth year's draft went to a station 60 miles south-east, and a heavy mortality ensued. The fifth year the owners reverted to the original station, and there was no loss.

The local inspector of stock (Mr. F. F. H. Shepherd) was asked if he could furnish other instances of the vagaries of tick fever, and mentioned the following:—

"A mob of 1,000 cows brought down from the Gulf to Leura Station were turned out there with absolutely no loss from fever. Another mob of Gulf cattle recently sold in this district developed fever after sale, and the loss was disastrous. A mob of bulls from the Gladstone district, passing through the Rockhampton district some time ago, and asserted to be suffering from redwater before starting, developed fever twice within the Rockhampton district, and a third time near Mackay. And the number of cases could easily be multiplied."

A gentleman who has studied this subject for years thus illustrates his experience:—

"I consider the infested country as a vast chessboard. Move cattle from a black square to a black square, and they will be all right; move them from a black square to a white square, and you will have a loss which will range from 5 to 50 per cent."

Unfortunately, the squares are not defined. There is no possibility of ascertaining beforehand whether the cattle from one tick-infested run will or will not develop fever when placed upon another affected area. The above remarks apply whether the so-called immunity of the cattle is due to inoculation performed by the ticks or by man. That immunity is purely local is the verdict alike of the greatest scientific authority of the day and of the intelligent stock-owner.

To this rule of local immunity, a remarkable exception has been observed. Messrs. Archer Brothers, of Gracemere and Torsdale, have, for some years, been in the habit of starting mobs of bulls for sale up the coast as far as Ingham, and down as far as Maryborough, and it has been noted that, not only do these bulls retain their immunity on the road, but that, so far as can be ascertained, none of them have contracted the disease after delivery.

Mr. C. H. Dawson, who represents Messrs. Archer Brothers in such matters, gives details of transactions in recent years. In 1902, he took 100 bulls from Torsdale as far as Kilkivan, selling on the way to about thirty owners. In 1903 and 1904, 100 bulls went to Gayndah. In 1905, the same number went South, and 150 more to Ingham. In 1906, 100 were drafted South. In 1907, 210 went North to Bowen, and 100 to Kilkivan, and in the present year 130 were sent South to Kilkivan. With these cattle—1,090 head in all—there was not a solitary case of redwater on the road, and Mr. Dawson has not heard of any of them suffering from the disease since delivery. Again, in January of last year, he left twelve bulls at Boobyjan Station for sale. At that time the station cattle were dying from redwater, but none of the Archer bulls sickened, nor have they since contracted the disease.

Bulls are a class of cattle notoriously susceptible to the fever. In the face of these figures it seems hardly possible to believe that the Gracemere tick does not confer a general immunity. Were this proved to be the case beyond all shadow of doubt, were it possible to affirm positively that an animal, which had reacted properly after inoculation with the Gracemere blood, was absolutely proof against fever in any part of Queensland, cattle-owners throughout the State would be relieved from one of the greatest dangers they have to face. In fact, the "universal virus," for which Professor Koch vainly sought in South Africa, may have been discovered in Queensland.

Mr. R. S. Archer, while perfectly willing to afford information on the subject, and admitting the facts to be as stated above, declines to express any opinion as to the deductions to be drawn therefrom.

Mr. Shepherd says:—"I have observed the immunity from fever enjoyed by cattle bred upon Torsdale and Gracemere, or depastured for a time on these runs, when travelled to other tick-infested areas, and have reported the matter to the Stock Department, suggesting scientific investigation. If it can be proved that the Gracemere blood confers absolute immunity from tick fever throughout the State, or over any considerable portion thereof, an immense benefit will be conferred on the stock-owners. All the evidence I have been able to obtain points to the desired conclusion, but until thoroughly comprehensive tests have been made it is impossible to say more."

Messrs. Archer and their clients are well satisfied with the results obtained —the why and wherefore does not concern them greatly. To Mr. Shepherd belongs the credit of noting the potential value of these results to cattle-owners throughout the State."

This matter is receiving the earnest attention of Mr. S. Dodd, a veterinary expert, whose services have lately been secured by the Department of Agriculture and Stock. This gentleman's qualifications eminently fit him for the task.

REPORT ON THE METHODS ADOPTED FOR THE ERADICATION OF CATTLE TICKS IN THE UNITED STATES OF AMERICA.

BY SYDNEY DODD, F.R.C.V.S.,

Principal Veterinary Surgeon and Bacteriologist to the Queensland Department of Agriculture and Stock.

Having been instructed to proceed to Queensland, *viâ* the United States, in order to investigate the tick problem in that country, and the method which the authorities have adopted for coping with tick fever, I obtained a letter of introduction from the British Foreign Office to the United States Minister of Agriculture through Sir H. Tozer, Agent-General for Queensland. Mr. Wilson, Minister for Agriculture, was anxious to aid me in my investigations, and gave instructions to all the officials of the Department of Agriculture to furnish me with all the information possible, and I have the greatest pleasure in expressing my appreciation for the assistance and courtesy extended by all of them.

Unfortunately, it being winter when I reached the United States, there was very little actual field work being done by the department. The ticks in the region where operations are being carried out are not active during this time of the year, and, consequently, the work was practically at a standstill. However, I had numerous interviews with the officials at Washington who are responsible for the planning of the campaign, and also with men who have had charge of a good deal of the actual work in the field. My researches also took me down into Carolina and Virginia, where a good deal of work is in progress, and where some of the veterinary inspectors have remained throughout the winter preparing for the next season's operations, and by their courtesy was taken over farms in the various localities, and shown where the work was being carried on. By this means, although the actual field work of tick eradication was in abeyance, yet I was thus not only able to get a practical illustration of what the United States authorities were doing, but also see the conditions under which the tick lived in the States and how the work was being performed. I also interviewed a number of farmers whose premises had been, or still were, infested with ticks, in order to ascertain, as far as possible, the farmer's point of view of the problem of tick eradication, and I must confess that although they were agreed that the veterinary authorities were conducting a praiseworthy campaign, yet they did not appear to take as active an interest in the matter as was warranted by the presence of the pest.

I also had the good fortune to meet with two very intelligent farmers from Texas, where fairly large herds of cattle exist, and where a large number of ranches are tick infested. One gentleman owned about 1,000 head of cattle in

a tick-infested area, but he had recognised the rôle which the tick played in the transmission of Texas fever (or tick fever), and, by fencing his land and not permitting his cattle to stray off it, or new cattle to be introduced without first ascertaining that they were free from ticks, he had kept his herd and land quite tick free, and, consequently, never lost an animal from tick fever. He also got better prices in the market for his cattle than did his neighbours, whose cattle were tick infested, but he acknowledged that the presence of these cattle around his farm were always a source of anxiety to him, especially as a tick-infested bull might break down his fence and get on to his pastures. When asked what was the attitude of the stock-owners generally in his district, he replied that it was one of utter indifference, the owners not caring whether they got rid of the tick or not; in fact, some men would not buy cattle unless they had ticks upon them, thus insuring that they had already gone through an attack of tick fever.

Several visits were paid to the Experimental Farm and Laboratory at Bethesda, Maryland, where a good deal of work has been done in experimenting with dips, &c. Some very useful and interesting experiments are also being carried out with regard to tuberculosis in pigs, and the occurrence of tubercle bacilli in butter. Also, to the Bacteriological Laboratories in Washington, D. C. Here they have been working on the question of obtaining a curative or preventive serum against swine fever. I also interviewed the Chief of the Dairy Division and the Dairy Bacteriologist, for the purpose of ascertaining what they had been doing with regard to fishiness in butter, and was informed that they had been troubled a good deal with this question, especially in the State of Wisconsin, where a laboratory had been established chiefly for the purpose of carrying on research work in the matter; but although they had been at work now for two years they had not arrived at a solution of the problem, although some progress had been made, inasmuch as they had succeeded in excluding quite a number of factors which had hitherto been suspected of playing some part in it. From what I gathered, they consider the process to be more of a chemical nature than a bacterial one.

The large, and almost new, quarantine station at Athenia, New Jersey, was also visited, in order to see the means which the States have of dealing with live stock arriving from foreign countries, and also the live-stock yards at Buffalo, where large numbers of animals are shipped for export. Here, also, some of the large abattoirs and packing-houses were inspected, for the purpose of noting the system of meat inspection. An opportunity was taken to stop at Ottawa, Canada, for the purpose of gaining information concerning the Veterinary Department there. Although only a few years have elapsed since its reorganisation, yet it has, under Dr. Rutherford, the Veterinary Director-General, made great progress. Their new meat-inspection law, which came into force at the end of 1907, is a very good one, and much good should result from its enforcement. They appear to be making good progress in the control of swine fever and glanders. At the experimental station experiments with a herd of tuberculous cattle are being carried out on the subject of the outdoor treatment of tuberculosis in cattle.

Although, judging from what I observed and from information obtained, the United States Department of Agriculture has, on the whole, been successful in its preliminary campaign against the cattle tick. It would be a great mistake to imagine that the problem of dealing with tick fever in Queensland is solved, or that the task is a simple one. On the contrary, it is one beset with many difficulties. As to whether the methods in vogue in the United States have any practical application in Queensland, it is obviously premature to make any statement, but it is intended at the earliest opportunity to carry out a series of experiments on lines which may have to undergo modification in order to meet the various conditions obtaining in this country; but, above all, the sympathy and active co-operation of all cattle-owners themselves is needed, without which all efforts in this direction will be of little avail.

It should be noted that the United States authorities have been working under conditions largely in their favour. The portions of territory upon which the work has been done are those which have been most easily cleaned of infection, and the climate has also been in their favour. They have had for some years a quarantine line, north of which tick-infested cattle are not permitted except under special conditions. Although this special work of the Federal Government only commenced in 1906, yet a number of individual States have been working on the problem of tick eradication for some years, thus rendering the task of the Federal authorities simpler. Railway facilities for transporting cattle are great, so that tick-infested cattle can be kept off the roads, &c. They have a large sum of money voted for the work of tick eradication, and a large staff of veterinary inspectors to supervise it.

The question of transport of young ticks in hay has not concerned them, as none of the counties worked in export hay at all, neither has the question of the carrying of ticks by horses or mules, although Dr. Melvin acknowledged that they will have to face this factor as they work further south.

I propose to give a brief outline of the conditions under which Texas fever or tick fever exists in the United States, and also the methods which the veterinary authorities have adopted for eradicating the tick from the pastures and cattle.

Texas fever or tick fever has existed in the United States of America for a large number of years, and is said to have been probably introduced into that country with cattle imported by the Spaniards during the early colonisation of Mexico and Southern United States. For years it was known that when the southern cattle were moved to northern States numbers of Northern-bred cattle living along the roads and on the pastures traversed by the southern cattle died, whilst the latter remained healthy; also, when northern cattle were taken south they almost invariably were attacked by the same disease. Investigations resulted, in 1885, in locating the infected, and in the establishment, in 1891, of a quarantine line by the United States veterinary authorities. This is considered by them to be the most important steps yet taken toward controlling the great losses occasioned by the disease. In 1889 and 1890 Kilbourne proved that the cattle tick was essential in the transmission of Texas fever. From this time onward, although much work was done in studying the disease and the life history of the tick, yet little was attempted in the eradication of the actual transmitter—namely, the tick—beyond the maintaining of the quarantine line, except in the case of a number of individual States situated in the infected area, who, no doubt, contributed in keeping the tick within bounds. This quarantine boundary stretches irregularly from California on the west coast right across the continent to Virginia on the east coast. South of this line practically the whole of the country is considered infested territory by the authorities. North of the line the country, except in isolated cases, is free from the cattle tick, and, consequently, from Texas fever also. Besides the safeguard afforded by the system of inspection of cattle, and the presence of inspectors all along the quarantine line, it must be held in mind that the country north of the line is naturally protected at a certain time of the year, as, owing to the low temperature during Winter, ticks do not live on cattle, but are killed off. It is usually the eggs which survive till Spring. As the quarantine line is pushed further south, however, owing to the freeing of areas from tick infestation, this protection will be lost, as then the ticks will be able to live and propagate all the year round.

The quarantine line is very strictly guarded, and no movement of cattle across this from south to north is permitted to take place, save for the purpose of immediate slaughter; and, in this case, movement is allowed only by rail or ship, not by road. The cars in which the cattle are transported are marked conspicuously, "Southern Cattle." From the cars, the cattle are put direct into pens labelled "Quarantine Pens, or Yards," at stockyards approved of by

the authorities, and not moved thence except to the slaughter-houses. Railway cars, stockyards, &c., have to be disinfected before they are used again, in order to destroy any ticks which may have hatched from those dropped from the infested cattle. The regulations governing the movement of cattle below the quarantine line are made yearly by the Minister of Agriculture, under the advice of the veterinary authorities, and they define the boundary of infested districts. Below the quarantine line, provisionally quarantined areas exist, from which cattle may be moved to northern districts at certain times of the year, after inspection by a veterinary inspector, and subject to his granting a certificate. It has been estimated that the loss occasioned by tick fever in the United States to the people in the infected districts is not short of £8,000,000 per annum. Occasionally a slight outbreak of tick fever occurs north of the quarantine line, as a result of the inefficient carrying out of the quarantine regulations, such as the disinfection of cars, or by the wilful breaking of the regulations by cattle-dealers, or by accident. The damage, however, is usually slight, and the outbreak does not get beyond control.

In the summer of 1906, the United States Federal authorities seriously took into hand the problem of eradicating the tick, and during the period in which they have been at work—1906-7—they claim to have cleared a large area from ticks, thus throwing the quarantine line further south. During 1907, 300 officers were employed in the work of tick eradication by the Federal Government, one-fourth of whom were qualified veterinarians. The sum of £50,000 (250,000 dollars) was voted by Congress, and spent in this work, besides that spent by the various States concerned, the latter also employing their own men in addition to those mentioned above.

In the report of the Chief of the Bureau of Animal Industry for 1907, he says:—"Still large amounts must be provided if the work is to be prosecuted on a sufficiently large scale to bring success within a reasonable time."

It must be remembered, however, that in some districts that comprise the area cleared by the department the herds of cattle are not many in number, or the herds themselves are small, and also, that although an area may be infested with ticks, yet every individual farm or herd in this area may not necessarily be infested—in fact, quite a number are free.

For example, in Benton County, Arkansas, a State below the quarantine line, 77,474 cattle were inspected in 1906, 75,993 were free and 1,481 tick-infested, thus equalling a little less than 2 per cent. of cattle tick infested in this district.

In Childers County, Texas, also in the quarantined area, 23 premises, covering 54,260 acres, with 7,875 cattle, were inspected, but no ticks were found. In Cottle County, Texas, there are practically no small farms, the county being made up of ten big ranches, of which six are tick free, covering 25,426 acres, with 4,140 cattle; and four are tick infested, comprising 154,600 acres, with 10,700 cattle. These were only slightly infested, whilst some of the pastures of infested ranches were tick free. The total inspections made in Texas in 1906 show 315 premises, with 1,349,564 acres and 101,448 cattle free from ticks; and 220 premises, with 2,582,883 acres and 156,110 cattle tick infested.

The whole of the work undertaken is based upon the knowledge that if southern cattle, even though carrying the causal organisms in their blood, are free from ticks, they may be allowed to mingle with susceptible animals without any danger of the latter contracting tick fever; also, from the study of the life history of the tick, and from the fact that pastures are not permanently infested by the tick, but that the land must continually be reinfested by fresh ticks dropped from cattle or equines, and that cattle ticks cannot mature except upon these animals. The various methods for obtaining these results

are directed towards destroying the ticks on cattle, as well as getting rid of them from pastures.

During the winter in the States, the work of tick eradication at present comes to a standstill for reasons previously given, and the majority of veterinary inspectors employed in this work are transferred to other duties, such as meat inspections, &c. At the same time, however, a plan of campaign is formulated at headquarters—Washington—for the ensuing season. A veterinary surgeon is placed in charge of each district, and under him are placed other veterinary inspectors, who have charge of subdistricts. Then, again, these latter have with them several lay assistants or stock inspectors. These are always men who have a good deal of experience with cattle, and also are able to talk to the farmers on matters pertaining to ticks. In some cases it is necessary to employ stock inspectors who can live in the saddle and wield a lasso like a cowboy. These men work in groups of about twelve, each group having a cook and a camp outfit. They cover their territory systematically, roping and examining cattle wherever found. Before work is commenced, it is necessary for the Federal authorities to ascertain whether the State in which work is to be done has efficient laws for permitting districts or farms to be quarantined. If not, no work is attempted until such laws are passed.

The first and probably the most important stage in the campaign of tick eradication is an educational one. Means are taken to educate the cattle-owners as to the nature of tick fever, the method of its transmission, and how it may be combated. This is accomplished by employing educated stock inspectors, who of necessity are daily in personal touch with the stock-owners, and who must be able to impart the necessary information; also, by the giving of lectures and addresses on the subject wherever possible by the veterinary inspectors to farmers' societies, &c., and by enlisting the active sympathy of every influential farmer in their district; also by articles published in the local Press, and by bulletins distributed freely by the department among cattle-owners.

The authorities realise that the greatest factor in the successful issue of the work of tick eradication is the co-operation of the stock-owner himself, and in the States there is a good deal of opposition, both passive and active, on the part of the farmer. Sometimes this arises through ignorance, but at others it is sheer indifference, the owner not caring whether his cattle are tick infested or not, nor whether he causes his neighbours' cattle to become infested. One probable explanation for this frame of mind is that the infested districts have harboured the tick for so many years that, in some cases, the cattle-owner does not realise the monetary loss he incurs every year, nor the damage done when the disease gets into non-immune districts. In the report previously quoted, Dr. Melvin says:—"While for the most part the State authorities have co-operated, it is unfortunate that in some sections the bureau's work has met with a lack of support, and even with active opposition; this condition probably being due to a failure to realise the benefits to follow from the work. It, therefore, seems best not to resume operations in such localities until public sentiment changes." In some counties within the infested districts bordering on the quarantine line, the local authorities have organised cattle clubs composed of stock-owners, with a view of interesting them in ridding their premises of ticks, and in preventing cattle from tick-infested farms from coming on to their premises; and it is said that this has been attended with good results. These stock-owners are also able to combine and free their districts from ticks. It is then inspected by a veterinary inspector, who may then release the district from quarantine if such action is warranted. A great obstacle to the voluntary clearing of his land from ticks by a farmer is that, although he may be willing to do his part, he objects to freeing his premises whilst his neighbours do nothing to their's.

General Notes.

TO GET RID OF FLEAS.

Dr. L. O. Howard, Chief of the Bureau of Entomology of the United States Department of Agriculture, writes to "Science" of 29th November last:—"Mr. E. M. Ehrhorn, the well-known entomologist, who is Deputy Commissioner of Horticulture in California, gives me the following: Fill a soup plate with soap suds, in the centre place a glsss of water with a scum of kerosene on top; place the soup plate on the floor in an infested room, and set fire to the kerosene at night. Fleas in the room will be attracted, and will jump into the soap suds."

A MONSTER RADISH.

There is a variety of radish grown in Japan that makes 20-lb. edible roots. It is called Sacruratina, and can be had of Northern seedsmen. It has a crisp and sweet rather than a peppery taste, and, while the abnormal size mentioned is not likely to be common, yet a 1-lb. or 2-lb. radish would suffice for an ordinary family.

THE USEFUL TOAD.

It is said that every toad in the garden is worth 20 dollars, as it destroys insects it would cost that amount to kill by ordinary methods. Besides, do they not catch flies?

PEPPER POT.

Whole ginger, 2 oz.; pepper corns, 2 oz.; turmeric, 2 oz.; cayenne pepper, 2 oz.; chillies, 2 oz.; mustard, 1 teacup; curry powder, 1 teacup; vinegar, 1 gallon (in lieu of cassareep). Boil together twenty minutes. Put in a stone jar having a cover. Add any odds and ends of cold game, fowls, meat, &c. Vegetables *must* have a jar to themselves, if required. It will be ready for eating in a fortnight, though it requires twenty years or so to attain the true exquisite "goût." Never under any circumstances attempt to clean the jar. To do so is something worse than sacrilege. The sauce may be renewed as it is used up.

Answers to Correspondents.

DISEASE IN FOWLS.

C. C. ATKINSON, Cashmere.—

Mr. Fern, Poultry Expert, says:—"The symptoms you describe do not point to any disease, but simply that the birds are suffering from the effects of lice or mites, and the remedy is the use of any good insect powder dusted well into the feathers. Houses and roosts must be treated liberally with lime-wash to which carbolic acid may be added. Dust-baths of sifted ashes to be provided if the birds have not the advantage of a free range."

MATERIALS FOR A DIP.—PLANET JUNIOR IN THE VINEYARD.—GROWING GRAPE VINES FROM CUTTINGS.

SEDBERGH TOWERS, Charters Towers.—

1. The Department of Agriculture and Stock recommends the following ingredients for a reliable dip mixture:—Arsenic, 8 lb.; caustic soda, 4 lb.; Stockholm tar, 1 gallon; tallow, 8 lb.; water, 400 gallons.

Directions.—(*a*) Half-fill with water a 5-gallon drum, add 2 lb. caustic soda, and boil; then add slowly 8 lb. arsenic. Add cold water in small quantities, to prevent over-boiling, till the drum is full. (*b*) Boil 100 gallons of water in a 400-gallon tank; add 2 lb. caustic soda, then 8 lb. tallow, and boil quickly. Add slowly in a thin stream 1 gallon Stockholm tar. When the whole of the tar has been added, boil from thirty to forty minutes; then add the solution prepared in accordance with instructions in (*a*); gradually fill the tank with water, and keep the mixture boiling until the tank is full.

2. Mr. Quodling, Inspector of Agriculture, to whom your questions on grape cuttings were submitted, says:—The Planet Junior single-horse machine can be used with advantage in the vineyard. The width between the vines is not stated, but for large areas the horse machine is most economical.

3. I would suggest bending down (layering) conveniently situated portions of the vine, to encourage the formation of roots. This should be done at least three months before the dormant season. Subsequently, cuttings may be made in the ordinary way, but with the advantage of having a base with small roots, or calloused over ready to strike. We have, at the suggestion of Mr. Rainford, late Instructor in Viticulture to this Department, buried grape cuttings for several weeks, and they have rooted and thrown out shoots in a very satisfactory manner.

FOOD VALUE OF GRASSES.

J. M. B., "Ageston."—

No analyses have been made of blady grass or of ditch millet. They are both very coarse hard grasses, and can only be of value as fodders in a very young stage of growth. Buffalo grass is a nutritious, valuable fodder, as shown by the complete analysis given by the Agricultural Chemist, Mr. J. C. Brünnich, in the annual report of the Department.

PEACH-TREE PARASITE.

INQUIRER, Carrington, Cairns.—

The plant you forwarded is one of the mistletoe family, named botanically *Loranthus longiflorus*. If allowed to spread, it will eventually kill the tree. Your letter of 20th, as it appeared to require a prompt reply, was answered by letter.

The Markets.

PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	APRIL. Prices.
Apples (Eating), Imported, per case	6s. 6d. to 8s. 6d.
Apples, New England, per packer	...
Apples, Cooking, per case	6s. to 8s.
Apricots, Local, per packer	...
Bananas, Fiji, per case	...
Bananas, Fiji, per bunch	...
Bananas, Queensland, Sugar, per dozen	$2\frac{1}{2}$d. to 3d.
Bananas, Queensland, Cavendish, per dozen	3d.
Cocoanuts, per dozen	..
Custard Apples, per case	5s. to 6s.
Grapes, per lb.	...
Lemons (Lisbon), per case	3s. to 5s.
Lemon, rough, per case	...
Mandarins, per case	3s. 6d. to 6s. 6d.
Nectarines, per box	...
Oranges (navel), per case	3s. 9d. to 4s. 1d.
Oranges (ordinary), per case	2s. to 3s. 3d.
Passion Fruit (Local), per case	3s. to 3s. 9d.
Papaw Apples, per quarter-case	...
Peaches, per quarter-case	...
Pears, per case	10s. to 12s. 6d.
Persimmons, per case	8s. to 8s. 6d.
Piemelons, per dozen	...
Pineapples (Queensland), Ripley's, per case	4s. to 5s.
Pineapples (Queensland), rough, per dozen	9d. to 1s. 6d.
Pineapples (Queensland), smooth, per dozen	2s. 9d. to 4s.
Plums, per quarter-case	...
Quinces, per gin case	...
Rockmelons, Local, per gin case	...
Rosellas, per sugar bag	1s. 6d. to 2s. 3d.
Tomatoes, per quarter-case	2s. to 4s.
Watermelons, Local (large), per dozen	...
SOUTHERN FRUIT MARKET.	"
Bananas, Fiji, per case	15s. to 15s. 6d.
" " per bunch	4s. to 10s.
" Queensland, per bunch	2s. to 6s. 6d.
" " per case	12s. to 12s. 6d.
Cocoanuts, per bag	...
" per dozen	...
Mandarins (Queensland), Emperor, choice, per case	7s. to 8s.
Oranges, per case	7s. 6d.
Oranges, common, choice, per case	...
Oranges, medium, per case	...
Passion Fruit, per quarter-case	6s. 6d.
Peaches, Victorian, per box of $7\frac{1}{2}$ dozen	...
Peanuts, per lb.	...
Pears, per bushel case	...
Pineapples, Queensland (Queen), per case	7s. to 8s.
Pineapples, Queensland (rough), choice, per case	7s. to 9s.
Pineapples, Queensland, medium, per case	6s. to 7s.
Persimmons, per case	7s.
Pomegranates, per case	...
Rockmelons, per gin case	...
Tomatoes, per box	...

The wharf labourers' strike has, it is stated, disorganised the interstate fruit trade.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MAY.

Article.		MAY. Prices.
Bacon, Pineapple	lb.	8d. to 9½d.
Bran	ton	£8 5s.
Butter, Factory	lb.	1s. 1d.
Chaff, Mixed	ton	£3 to £5 10s.
Chaff, Oaten	„	£6 to £7
Chaff, Lucerne	„	£4 15s. to £5 5s.
Chaff, Wheaten	„	£3 5s. to £3 10s.
Cheese	lb.	8½d.
Flour	ton	£10 15s. to £11
Hay, Oaten	„	£7 15s. to £8
Hay, Lucerne	„	£2 10s. to £4 10s.
Honey	lb.	3d. to 3¼d.
Maize	bush.	4s. 4d. to 4s. 8d.
Oats	„	3s. 6d. to 4s.
Pollard	ton	£8 5s.
Potatoes	„	£4 to £9
Potatoes, Sweet	„	...
Pumpkins	„	...
Wheat, Milling	bush.	5s.
Wheat, Chick	„	4s. 9d. to 5s.
Onions	ton	£7 10s. to £8
Hams	lb.	11d. to 1s.
Eggs	doz.	1s. 0½d. to 1s. 7d.
Fowls	pair	2s. 6d. to 3s. 6d.
Geese	„	...
Ducks, English	„	3s.
Ducks, Muscovy	„	3s. 9d. to 4s.
Turkeys (Hens)	„	...
Turkeys (Gobblers)	„	...

ENOGGERA SALEYARDS.

Animal.	APRIL. Prices.
Bullocks	£8 to £9 5s.
Cows	£6 10s. to £7 17s. 6d.
Merino Wethers	18s. 6d.
C.B. „	21s. 6d.
Merino Ewes	15s. 9d.
C.B. „	21s.
Lambs	16s. 9d.
Pigs (Baconers)	...
„ (Porkers)	...

Farm and Garden Notes for July.

FIELD.—The month of July is generally considered the best time to sow lucerne, for the reason that the growth of weeds is practically checked, and the young lucerne plants will, therefore, not be choked by them, as would be the case if planted later on in the spring. If the ground has been properly prepared by deep ploughing, cross-ploughing, and harrowing, and an occasional shower occurs to assist germination and growth, the lucerne will thrive so well that by the time the weeds once more appear it will be able well to hold its own against them. From 10 to 12 lb. of seed will be sufficient for an acre. This is also the time to prepare the land for most field crops, such as potatoes, maize, oats and barley, rye, vetches tobacco, cotton, sugar-cane, field carrots, mangolds, swedes, canaigre, &c. Early potatoes, sugar-cane, and maize may be planted in very early districts, but it is risky to plant potatoes in this month in any districts liable to late frosts, and in low-lying ground it is better to wait till the following month. The greatest loss in potatoes and sugar-cane has been experienced in September, when heavy frosts occurred in low-lying districts in the Southern portion of the State. During suitable weather, rice may be sown in the North. The coffee crop should now be harvested, and yams and turmeric unearthed.

KITCHEN GARDEN.—Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. Never walk over the land during wet weather with a view to sowing. The soil cakes and hardens, and good results cannot then be expected. This want of judgment is the usual cause of hard things being said about the seedsman. In fine weather, get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil is deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, mustard and cress, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts, it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will now want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up grown plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, coxcombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

Orchard Notes for July.

By ALBERT H. BENSON, M.R.A.C.

THE SOUTHERN COAST DISTRICTS.

The Notes for the month of June apply to July as well. The fruit crop of strawberries will be ripening during the month, though extra early fruit is often obtained in June, and sometimes as early as May, under especially favourable conditions. Look out for leaf blight and spray for same with Bordeaux mixture, also watch for the first signs of the grey moth that attacks the fruit, and spray with the sulphide of soda wash. The larvæ of the cockchafer that eats the roots of strawberries should be looked for and destroyed wherever found. Pruning of citrus and other fruit trees may be continued; also the spraying with lime and sulphur. Where the ringing borer, that either attacks the main trunk or the branches at or near where they form the head of the tree, is present, the main stems and trunks should either be painted or sprayed with the lime and sulphur wash during the month, as the mature beetles that lay the eggs that eventually turn to the borers sometimes make their appearance during the month, and unless the trees are protected by the wash they lay their eggs, which hatch out in due course and do a lot of damage. Keep the orchard clean, so that when the spring growth takes place the trees may be in good condition. There is usually a heavy winter crop of pineapples ripening during this and the following months, particularly of smooth leaves. See that any conspicuous fruits are protected by a whisp of grass, as they are injured not only by frost but by cold westerly winds.

THE TROPICAL COAST DISTRICT.

See the instructions given for the month of June. Keep the orchards clean and well worked. Prune and spray where necessary.

SOUTHERN AND CENTRAL TABLELANDS.

Where pruning of deciduous trees has not been completed, do so this month. It is not advisable to leave this work too late in the season, as the earlier the pruning is done after the sap is down the better the buds develop, both fruit buds and wood buds; thus securing a good blossoming and a good growth of wood the following spring.

Planting can be continued during the month. If possible, it should be finished this month, for though trees can be set out during August, if a dry spell comes they will suffer, where the earlier planted trees, which have had a longer time to become established, will do all right, provided, of course, that the land has been properly prepared prior to planting, and that it is kept in good order by systematic cultivation subsequent to planting.

Don't neglect to cut back hard when planting, as the failure to do so will result in a weakly growth. As soon as the pruning is completed the orchards should get their winter spraying with the sulphur-lime wash, and either with or without salt as may be wished. See that this spraying is thoroughly carried out, and that every part of the tree is reached, as it is the main treatment during the year for San José and other scale insects, as well as being the best time to spray for all kinds of cankers, bark rot, moss, litchens, &c.

When the orchard has not been ploughed, get this done as soon as the pruning and spraying is through, so as to have the land in good order for the spring cultivations. See that the work is well done, and remember that the

best way to provide against dry spells is to keep moisture in the soil once you have got it there, and this can only be done by thorough and deep working of the soil.

When obtaining trees for planting, see that they are on good roots, and that they are free from all pests, as it is easier to prevent the introduction of pests of all sorts than to eradicate them once they have become established. Only select those varieties that are of proved merit in your district; don't plant every kind of tree that you see listed in a nurseryman's catalogue, as many of them are unsuited to our climate. The pruning of grape vines may be carried out in all parts of the tablelands other than the Stanthorpe district, where it is advisable to leave this work as long as possible, owing to the danger of spring frosts.

Where grape vines have been well started and properly pruned from year to year, this work is simple; but, where the vines have become covered with long straggling spurs, and are generally very unsightly, the best plan is to cut them hard back, so as to cause them to throw out good strong shoots near the main stem. These shoots can be laid down in the place of the old wood in following seasons, and the whole bearing portion of the vine will be thus renewed.

Where vineyards have been pruned, the prunings should be gathered and burnt, and the land should receive a good ploughing.